(2)

AFOEHL REPORT
89-033EH0086DNA

Acoustic Tests on a New Motor Generator System for the Minuteman Launch Control Centers in Hill Engineering Test Facilities I and II, Hill AFB UT

TERRY M.FAIRMAN, Maj, USAF, BSC

April 1989

Final Report

Distribution is unlimited; approved for public release

AF Occupational and Environmental Health Laboratory
Human Systems Division (AFSC)
Brooks Air Force Base, Texas 78235-5501

NOTICES

When Government drawings, specifications, or other data are used for any purpose other than a definitely related Government procurement operation, the Government incurs no responsibility or any obligation whatsoever. The fact that the Government may have formulated, or in any way supplied the drawing, specifications, or other data, is not to be regarded by implication, or otherwise, as in any manner licensing the holder or any other person or corporation; or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

The mention of trade names or commercial products in this publication is for illustration purposes and does not constitute endorsement or recommendation for use by the United States Air Force.

The Public Affairs Office has reviewed this report, and it is releasable to the National Technical Information Service, where it will be available to the general public, including foreign nations.

This report has been reviewed and is approved for publication.

TERRY M. FAIRMAN, Maj, USAF, BSC
Senior Environmental Noise Consultant

DENNIS R. SKALKA, Lt Col, USAF, BSC
Chief, Consultant Services Division

Air Force installations may direct requests for copies of this report to: Air Force Occupational and Environmental Health Laboratory (AFOEHL) Library, Brooks AFB TX 78235-5501.

Other Government agencies and their contractors registered with the DTIC should direct requests for copies of this report to: Defense Technical Information Center (DTIC), Cameron Station, Alexandria VA 22304-6145.

Non-Government agencies may purchase copies of this report from: National Technical Information Service (NTIS), 5285 Port Royal Road, Springfield VA 22161

JAMES C. ROCK, Colonel, USAF, BSC
Commander

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

Form Approved OMB No. 0704-0188

1a. REPORT SECURITY CLASSIFICATION NA	1b. RESTRICTIVE MARKINGS
2a. SECURITY CLASSIFICATION AUTHORITY NA	3. DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release; distribution is unlimited
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE	
4. PERFORMING ORGANIZATION REPORT NUMBER(S) 89-033EH0086DNA	5. MONITORING ORGANIZATION REPORT NUMBER(S)
6a. NAME OF PERFORMING ORGANIZATION AF Occupational and Environmental Health Laboratory 6b. OFFICE SYMBOL (If applicable) ECH	7a. NAME OF MONITORING ORGANIZATION
6c. ADDRESS (City, State, and ZIP Code) Brooks AFB TX 78235-5501	7b. ADDRESS (City, State, and ZIP Code)
8a. NAME OF FUNDING/SPONSORING ORGANIZATION Same as 6a 8b. OFFICE SYMBOL (If applicable)	9 PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER
8c. ADDRESS (City, State, and ZIP Code)	10. SOURCE OF FUNDING NUMBERS PROGRAM ELEMENT NO. / PROJECT NO. / TASK NO / WORK UNIT ACCESSION NO

11. TITLE (Include Security Classification)
Acoustic Tests on a New Motor Generator System for the Minuteman Launch Control Centers in Hill Engineering Test Facilities I and II, Hill AFB UT

12. PERSONAL AUTHOR(S)
Terry M. Fairman, Maj, USAF, BSC

13a. TYPE OF REPORT	13b. TIME COVERED	14. DATE OF REPORT (Year, Month, Day)	15. PAGE COUNT
Final	FROM _____ TO _____	April 1989	182

16. SUPPLEMENTARY NOTATION

17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
FIELD	GROUP	SUB-GROUP	Noise Minuteman Launch Control Center Motor Generator Noise Abatement Noise Control

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

Post critical design review acoustic tests were performed in Hill Engineering Test Facilities I and II (HETF) on a proposed new motor generator system for the Minuteman Launch Control Centers (LCC). A performance noise criteria equivalent to a preferred noise criterion (PNC-50) curve was established as the standard by which to judge the effectiveness of the new motor generator. Measurements were obtained at both the commander's console and the deputy commander's console. Results indicated the noise from the motor generator as configured in HETF I (the small LCC) exceeded the PNC-50 criteria primarily in the 63 hertz (Hz) octave band by 10 decibels (dB) when operated in both the AC and DC modes. The motor generator as configured in HETF II (the large LCC) exceeded the PNC-50 criteria by 3 dB in the 125 Hz octave band only at the deputy commander's console when operated in the AC mode. Acoustic intensity measurements were obtained to isolate specific noise sources and determine the transmission loss of the floor panels.

(over)

20 DISTRIBUTION/AVAILABILITY OF ABSTRACT	21 ABSTRACT SECURITY CLASSIFICATION
☒ UNCLASSIFIED/UNLIMITED ☐ SAME AS RPT ☐ DTIC USERS	Unclassified
22a NAME OF RESPONSIBLE INDIVIDUAL Terry M. Fairman, Major, USAF, BSC	22b TELEPHONE (Include Area Code) (512) 536-3214 / 22c OFFICE SYMBOL AFOEHL/ECH

DD Form 1473, JUN 86 Previous editions are obsolete. SECURITY CLASSIFICATION OF THIS PAGE

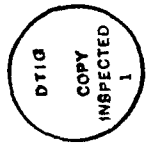
UNCLASSIFIED

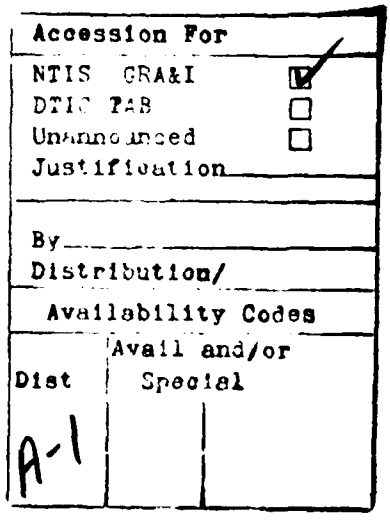
Cont'd Item #19

Vibration measurements were also made on and near the motor generator to determine paths of structure-borne vibration energy. Specific recommendations for improving the acoustic environment in the LCCs are presented.

Acknowledgments

The author gratefully acknowledges the assistance of Major John C. Ellis, II, AFOEHL/ECH, without whose help the data collection phase of this survey would not have been completed so smoothly. The assistance of Mr Mark White, OO-ALC/MMGRMM, at Hill AFB, in making all the appropriate arrangements at the test sites is also appreciated.





Contents

Illustrations

I. INTRODUCTION

A. Purpose

This report presents the findings and recommendations of an acoustic performance evaluation survey of a new motor generator system for the Strategic Air Command (SAC) Minuteman Launch Control Centers (LCC). The survey was performed at the request of OO-ALC/MMGRMM, the Directorate of Materiel Management for the Minuteman LCCs, at Hill AFB UT, during the period 29 Nov to 1 Dec 88. The objective of the survey was to determine if the new motor generator system (MGS) met the contractually established PNC-50 (preferred noise criterion) performance criteria for acoustic levels inside a fully operational LCC.

B. Background

Recommendations from USAFOEHL Report 85-073, "Noise and Vibration in Minuteman Launch Control Centers," were used by TRW, a USAF consultant for the Minuteman system, to design a noise specification for a new, quieter motor generator system. The Boeing Company, as the primary contractor, subcontracted to American Electronics, Inc., the design and construction of a new MGS which would, among other criteria, meet the acoustic performance specification for noise in the LCC. The new MGS designation is CI05200AA, Type I and Type II, the type being a reference to the LCC type (see SCOPE), and the old MGS designations are Figure A1367 (for a Type I LCC), and Figure A14106 (for a Type II LCC). For simplicity in this report, each MGS will be referred to as simply "old" or "new". The tests conducted at Hill AFB were the post critical design review acoustic tests.

C. Scope

TRW asked AFOEHL/ECH to provide noise measurements similar to those conducted for the above referenced report, and requested real time octave band noise measurements be conducted so noise abatement measures could also be evaluated in real time. The tests were conducted in two Hill engineering test facilities (HETF), designated I and II, which are respectively designed to represent the small and large LCCs found in the SAC missile wings. Tests were conducted on four motor generators, two each of the present configuration (i.e., the old MGS), and two each of the new configuration (i.e., the new MGS). One each of both the old and new MGS were evaluated in both LCC configurations. Working in the HETFs allowed the shutdown of various systems to determine the acoustic performance of the motor generators operating alone, as well as the acoustic environment with all systems operating normally. This was not possible during the 1984 SAC missile wing survey while the LCCs were on alert. The noise levels at both the commander's console (CC) and the deputy commander's console (DCC) were monitored under various operating conditions. These data were used to compare to the PNC-50 performance criteria. Acoustic intensity measurements were obtained over the MGS to determine the acoustic attenuation of the floor panels covering the MGS. Vibration measurements on the MGS and floor were obtained to determine structure-borne paths of acoustic energy. Recommendations to reduce the LCC acoustic levels to the PNC-50 noise criteria are provided.

II. DISCUSSION

A. Method

All data collection and analyses were performed using the Norwegian Electronics Model 830 Real Time/Intensity Analyzer. Intensity measurements employed the Norwegian Electronics Model 216 Intensity Probe. Other measurements used stationary microphones, Larson-Davis Model 2541 with Bruel & Kjaer (B&K) Type 2804 power supplies, feeding the channel 1 and 2 line inputs of the Norwegian Electronics 830 Real Time Analyzer. Channel 1 monitored the microphone signals at the commander's console and channel 2 monitored the microphone signals at the deputy commander's console. Both microphones were set on tripods at 1.15 meters above the floor, which is the average, sitting, ear-level height. Each microphone was positioned parallel to the floor and pointed toward the ear of the crew person. Measurements were made without the crew person in place. Three 30 second average measurements were obtained at both the right and left ear positions, and these six measurements were averaged to obtain the average noise level at each crew position for each measurement condition. The measurement conditions are shown in each of the summary tables presented in the Results Section.

Intensity measurements were made of the motor generator. The intensity probe was slowly swept over the area of the floor panel covering the motor generator. The probe was held approximately six inches above the floor when the panels were in place, and at the same height when the panels were removed. By measuring intensity with and without the floor panels the transmission loss of the floor panels could be determined. If there was not a significant difference in the intensity level, we could deduce there were significant paths of structure-borne noise inside the LCCs. The intensity probe also proved useful in determining specific sources of noise in the LCCs, since it has the ability to indicate the direction of sound energy.

Vibration measurements were obtained using the B&K Type 2516 Vibration Meter with the B&K Type 4384 Accelerometer and magnetic attachment. Vibration was measured on the rail mounts attached to the MGS at all four corners and on the floor at each of those four attachment points. Figures 2 and 3 in the Results Section are diagrams of the vibration measurement locations for HETF I and HETF II respectively. For the HETF I measurements, the Norwegian Electronics 830 Real Time Analyzer was used to obtain a 1/3 octave analysis of the AC output signal of the B&K Type 2516 Vibration Meter.

B. Results

1. Performance Measurements

The results of the performance measurements made at each crew position are provided in Appendix A. Results are displayed in octave bands as measured levels versus the PNC-50 criteria. Results are shown graphically and in tabular form. The graphic results are displayed as the measured level minus the PNC-50 criteria, thus the PNC-50 criterion is represented by the 0 decibel (dB) level on the vertical axis. Octave band levels which exceeded the 0 dB level have exceeded the PNC-50 criteria by the indicated amount, and

levels below 0 dB are octave bands which have met the PNC-50 criteria. Appendix B presents a 1/3 octave plot of the measured levels at each location and condition with an expanded frequency range (2.5 hertz - 10 kilohertz).

Table 1 is a summary of the octave band measured levels minus the PNC-50 criteria. The table shows both HETF I and II, with the old and new MGS in both AC and DC operation, at both the CC and DCC locations. The measurements in Table 1 were all obtained with the emergency air conditioning system (ECS) and all other systems turned off. Negative results indicate compliance with the PNC-50 criteria, and positive results indicate noncompliance with the criteria. Octave bands exceeding the PNC-50 criteria are highlighted in bold-italic print. The results show the new MGS in HETF II came very close to meeting the PNC-50 criteria and exceeded it only in the 125 Hz octave band by 1.3 dB at the CC, and 3.3 dB at the DCC under AC operation. With the MGS under DC operation the noise levels at both the CC and DCC met the acoustic performance criteria in all octave bands. For the new MGS in HETF I, under both AC and DC operation, the PNC-50 criteria were exceeded at both the CC and DCC in several octave bands, with the highest excursion averaging about 10 dB in the 63 Hz octave band in each case.

Table 2 shows the measured levels minus the PNC-50 criteria at the CC and DCC with both the MGS and the ECS operating. It is clear from this summary table that for both LCC types with both the old and new MGS, the desired PNC-50 noise level was always exceeded. For HETF I, the noise was very much greater under DC operation than AC, and there was no significant improvement with the installation of the pad mounts under the MGS. For HETF II the measured noise levels were only slightly higher under AC operation than DC. The noise increase when all systems were operating was primarily in the higher frequencies, which is typical of fan and air moving noise.

Table 3 summarizes the measurements made when the MGS was turned off in each LCC and the ECS was operated in both the AC and DC modes. When Table 3 is compared to Tables 1 and 2, it is clear the ECS system was the source of the higher frequency noise. In HETF I it is clear that, except for the 63 Hz component of the MGS, the acoustic environment was dominated by the noise from the ECS. This is dramatically shown in Figure 1 where the phenomenon is displayed graphically. Figure 1 shows the measured levels with respect to the PNC-50 criteria for the deputy commander's console in HETF I under DC operation. The upper chart is with the MGS on and the ECS off, and the lower chart is with the MGS off and ECS on. The noise levels in HETF II were much lower with the MGS off and only the ECS running. We were unable to obtain measurements in HETF II with the ECS operating on DC and the MGS off.

Table 1: Summary of measured octave band levels minus the PNC–50 criteria in Hill Engineering Test Facilities I & II. Measurements obtained at the Commander's and Deputy Commander's consoles with the ECS off.

	MEASUREMENT LOCATION	MOTOR GENERATOR		ECS MODE	Octave Band Measurement Level Minus PNC.50 Criteria (dB)								
		TYPE	MODE		31.5 (Hz)	63 (Hz)	125 (Hz)	250 (Hz)	500 (Hz)	1000 (Hz)	2000 (Hz)	4000 (Hz)	8000 (Hz)
HETF I	CC	OLD	AC	OFF	***8***	***2.8***	***1.1***	-2.4	***4.4***	***8.8***	-4.9	-8.7	-16.8
	DCC	OLD	AC	OFF	-1.5	***0.3***	-1.9	-2.5	***3.8***	***5.8***	-1.8	-6.7	-13.5
	CC	NEW	AC	OFF	-0.1	***3.3***	***3***	-0.4	***2.5***	-5.3	***2.4***	-8.1	-13.3
	DCC	NEW	AC	OFF	-0.5	***10.6***	***2.9***	-0.2	***0.8***	-4	-1.6	-6.6	-10
	CC	NEW	DC	OFF	-1.1	***8.8***	***7.5***	-2.2	***3.2***	-5	***0.6***	-8.4	-14.1
	DCC	NEW	DC	OFF	-0.9	***10.1***	***2.3***	-2.6	***1***	-4.4	***0.8***	-6.8	-11.3
	CC	NEW *	AC	OFF	-1.1	***11.1***	***0.8***	-4.2	-6.4	-7.3	-3.6	-9.8	-13.2
	DCC	NEW *	AC	OFF	-1.6	***6***	***1.8***	-1.8	-2.8	-6.6	-0.9	-7.1	-9.6
HETF II	CC	OLD	AC	OFF	-4.9	-12.3	-1.6	-4.5	-0.2	***0.5***	***0.4***	-1.2	-2.1
	DCC	OLD	AC	OFF	-5.8	-8	1	-6.3	-1.4	-1.5	-2.7	-4.8	-5.9
	CC	NEW	AC	OFF	-5.3	-7.2	***1.3***	-5	-4	-11.4	-13.8	-15.1	-16.3
	DCC	NEW	AC	OFF	-1.3	-5.7	***3.3***	-5	-5.2	-9.3	-13.2	-10.3	-11.3
	CC	NEW	DC	OFF	-11.9	-7.7	***0.1***	-6.6	-5.5	-12.5	-12.3	-11.6	-16.3
	DCC	NEW	DC	OFF	-5.6	-6.9	-5.2	-6.5	-7.2	-8.6	-11.2	-6.4	-10.9

* Measurements made with pad mounts installed.

- Exceedances highlighted in Bold-Italic.

Table 2: Summary of measured octave band levels minus the PNC–50 criteria in Hill Engineering Test Facilities I & II. Measurements obtained at the Commander's and Deputy Commander's consoles with the ECS operating.

	MEASUREMENT LOCATION	MOTOR GENERATOR		ECS MODE	Octave Band Measurement Level Minus PNC.50 Criteria (dB)								
		TYPE	MODE		31.5 (Hz)	63 (Hz)	125 (Hz)	250 (Hz)	500 (Hz)	1000 (Hz)	2000 (Hz)	4000 (Hz)	8000 (Hz)
HETF I	CC	OLD	AC	AC	***5.4***	***5.3***	***11.7***	***5.1***	***8.3***	***13.2***	***10.9***	***10.9***	***4.1***
	DCC	OLD	AC	AC	***3.6***	***1.7***	***8.3***	***6.6***	***8.1***	***11.3***	***9.8***	***12.2***	***5.4***
	CC	OLD	DC	DC	***11.5***	***10.5***	***7.5***	***11.3***	***13.2***	***21.3***	***19.6***	***11.3***	***1.1***
	DCC	OLD	DC	DC	***9.6***	***7.4***	***7.9***	***14.4***	***15.5***	***22.4***	***21.6***	***11.7***	***3***
	CC	NEW	AC	AC	***0.9***	***6.4***	***12***	***4.3***	***8.1***	***7.5***	***11.7***	***10.2***	***4.2***
	DCC	NEW	AC	AC	***1.2***	***8.1***	***9.3***	***4.8***	***6.5***	***5.9***	***9.8***	***11.2***	***6.5***
	CC	NEW	DC	DC	***6.4***	***6***	***7.3***	***12.1***	***13.4***	***20.9***	***18.1***	***11***	***1.1***
	DCC	NEW	DC	DC	***6.8***	***10.3***	***5.7***	***13.4***	***14.7***	***22***	***23.6***	***11.2***	***3.2***
	CC	NEW *	AC	AC	***0.1***	***10.4***	***10.5***	***3.9***	***6.2***	***7.4***	***11.2***	***10.4***	***4.2***
	DCC	NEW *	AC	AC	***0.7***	***6.2***	***6.8***	***4.7***	***6.1***	***5.8***	***9.3***	***10.8***	***6.2***
HETF II	CC	OLD	AC	AC	***7.9***	***4.6***	***7.4***	***3.6***	***6***	***6.6***	***8.8***	***8.9***	***6.9***
	DCC	OLD	AC	AC	***7.5***	***4.7***	***6***	***4.6***	***5.3***	***5.4***	***7***	***6.8***	***2.4***
	CC	OLD	DC	DC	***5.3***	***3.6***	***6.5***	***2.8***	***5.3***	***5.6***	***7.6***	***8.6***	***7***
	DCC	OLD	DC	DC	***6.4***	***4.4***	***3.6***	***0.6***	***3.3***	***3.7***	***5.2***	***6.2***	***2.4***
	CC	NEW	AC	AC	***7.3***	***4.6***	***4.1***	***5.6***	***5.6***	***4.9***	***6.8***	***6.5***	***1.7***
	DCC	NEW	AC	AC	***6.2***	***4.4***	***6.8***	***3.9***	***4.7***	***5***	***8.1***	***10.1***	***6.4***
	CC	NEW	DC	DC	***7.5***	***4.7***	***3.5***	***1.3***	***2.3***	***2.6***	***5***	***6.1***	***1.7***
	DCC	NEW	DC	DC	***7.4***	***4.2***	***5.6***	***3.2***	***3.6***	***4***	***7.2***	***10.2***	***6.7***

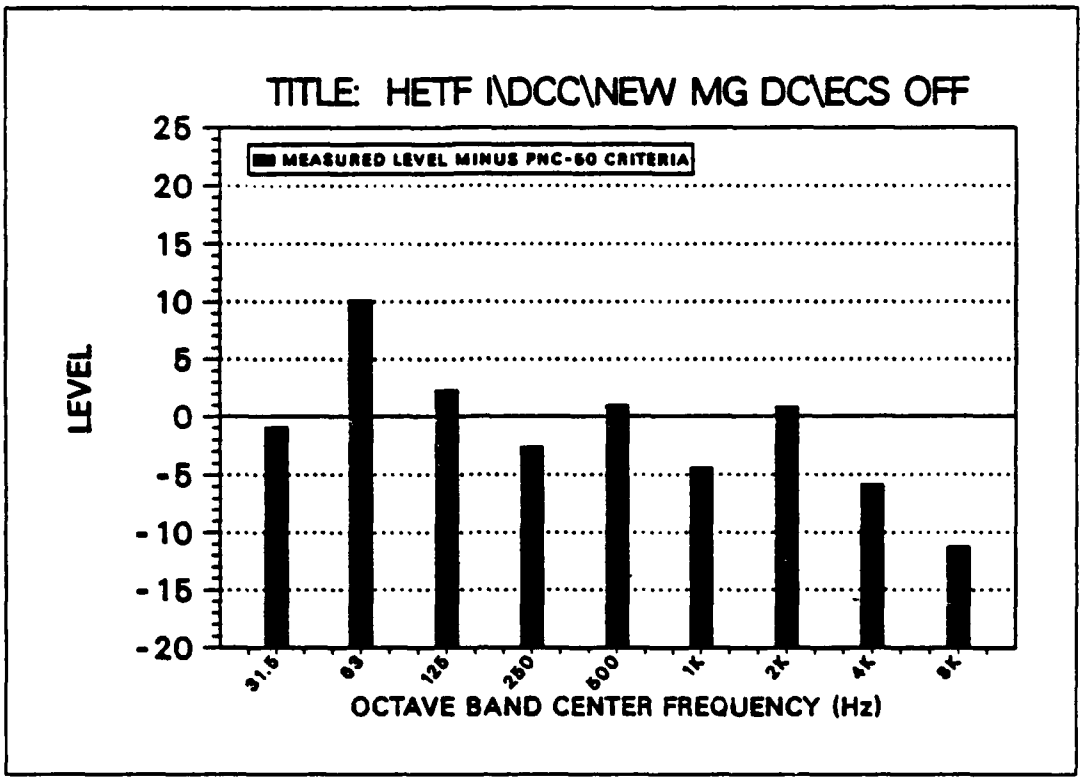
* Measurements made with pad mounts installed.

- Exceedances highlighted in Bold-Italic.

Table 3 – Summary of measured octave band levels minus the PNC–50 criteria in Hill Engineering Test Facilities I & II. Measurements obtained at the Commander's and Deputy Commander's consoles with the MGS off and ECS on.

	MEASUREMENT LOCATION	MOTOR GENERATOR		ECS MODE	Octave Band Measurement Level Minus PNC.50 Criteria (dB)								
		TYPE	MODE		31.5 (Hz)	63 (Hz)	125 (Hz)	250 (Hz)	500 (Hz)	1000 (Hz)	2000 (Hz)	4000 (Hz)	8000 (Hz)
HETF I	CC	OLD	OFF	AC	***0.4***	***0.6***	***0.2***	***1.0***	***4.5***	***6.9***	***10***	***9.3***	***3.4***
	DCC	OLD	OFF	AC	***1.6***	-2.2	***1***	***2.0***	***4.2***	***4.6***	***6.5***	***11.3***	***6.1***
	CC	OLD	OFF	DC	***5.7***	***2.7***	***3.2***	***11.2***	***13.2***	***16.6***	***16.7***	***10.7***	***0.7***
	DCC	OLD	OFF	DC	***5.0***	***3.6***	***5***	***14.1***	***14.7***	***20.7***	***21.0***	***11***	***2.5***
	CC	NEW	OFF	AC	-0.7	***0.6***	***0.7***	***2***	***4.4***	***7***	***10.2***	***8.4***	***3.6***
	DCC	NEW	OFF	AC	-0.3	-2.2	***1.3***	***2.0***	***4.2***	***5.1***	***9***	***11***	***6.3***
	CC	NEW	OFF	DC	***5.0***	***2.7***	***3.6***	***11.0***	***14.2***	***21.2***	***16.2***	***11.4***	***1***
	DCC	NEW	OFF	DC	***5.6***	***3.0***	***4.0***	***13.6***	***13.9***	***21.6***	***20.7***	***11.2***	***2.0***
HETF II	CC	OLD	OFF	AC	***7***	***4.3***	***1.5***	-0.4	***1.2***	***1.4***	***3.7***	***5.0***	***1.0***
	DCC	OLD	OFF	AC	***7.0***	***4***	***5.6***	***1.0***	***2.3***	***2.6***	***6.2***	***9***	***6.4***
	CC	NEW	OFF	AC	***7.7***	***4.6***	***1.0***	***0.1***	***1.6***	***2.1***	***4.5***	***6***	***1.6***
	DCC	NEW	OFF	AC	***6.6***	***4.3***	***5.1***	***2.4***	***3.3***	***3.5***	***7***	***10***	***6.6***

- Exceedances highlighted In Bold-Italic.



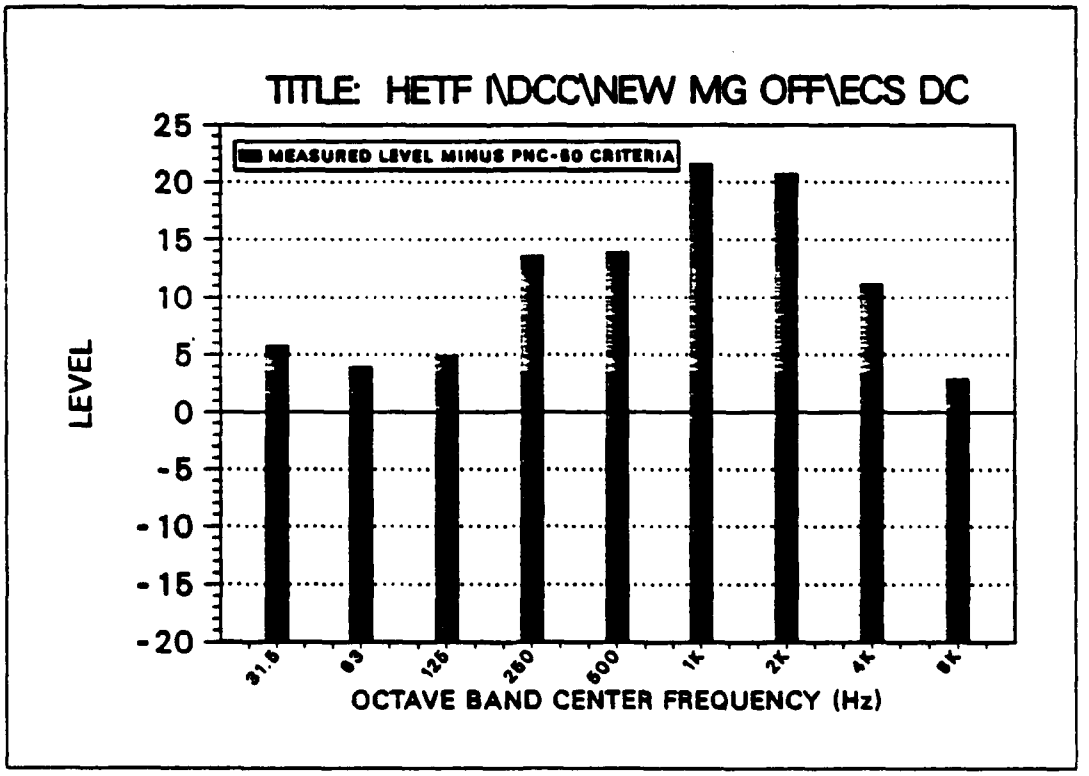


Figure 1: Measured exceedance levels at the deputy commander's console in HETF I with the new motor generator on DC and the ECS off versus the new motor generator off and the ECS on DC.

2. Intensity Measurements

The results of the intensity measurements taken over the MGS are presented in Appendix C. The column labeled 'I_{eq}' is the equivalent intensity level and the measurement of interest for this analysis. Table 4 presents a summary of the measured intensity levels over the MGS with and without the floor panels in place for HETF I and II under both AC and DC operation. The floor attenuation is found by subtracting the measured levels with the floor panels in place from the measured levels without the floor panels. Also indicated in the table is the expected attenuation ability of 1/4 inch thick steel plates. The variations in octave band attenuation under the different conditions, as shown in Appendix B, are discussed in the observations section of this report.

Table 4: Average floor transmission loss in Hill Engineering Test Facilities I & II as determined from intensity measurements.

	Octave Band Transmission Loss (dB)								
	31.5 (Hz)	63 (Hz)	125 (Hz)	250 (Hz)	500 (Hz)	1000 (Hz)	2000 (Hz)	4000 (Hz)	8000 (Hz)
1/4 in. Steel 'Ideal' Transmission Loss	17	23	29	35	40	40	40	41	48
HETF I Average Floor Transmission Loss	12.7	10.5	18.8	13.6	18.2	22.4	22.2	*	*
HETF II Average Floor Transmission Loss	15.4	10.9	21.6	26.5	21.2	21.9	20.8	17.8	18.1

* Result not obtained.

3. Vibration Measurements

The results of the vibration measurements are presented in tabular and graphic form in Appendix D. The 1/3 octave band graphs are only available for HETF I with the MGS on the pad mounts under AC operation. No 1/3 octave band data were obtained for any other condition. These charts are uncalibrated as far as absolute level goes, but are still instructive to show the distribution of the vibration energy in 1/3 octave bands.

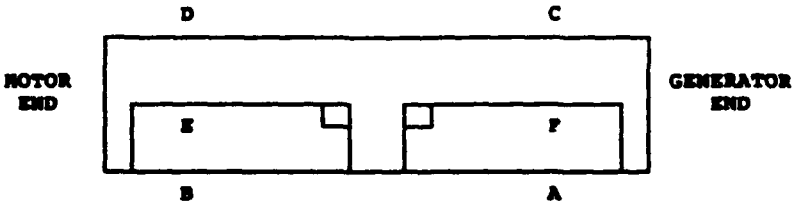
The overall calibrated vibration measurements obtained with B&K Type 2516 Vibration Meter are presented in Tables 5A and 5B. The tables present the measured vibration levels in each HETF for all conditions indicated. Figures 2 and 3 are the plan view diagrams showing the vibration measurement locations. The Table 5 series summarize the vibration measurements made only on the new MGS in both HETFs.

C. Observations

1. Performance

Although the HETFs are designed as close to the operational LCCs as possible, there were a few differences of note which may have some effect when using the results to predict the actual LCC noise environment. The primary difference between HETF I and a Type I LCC is the floor suspension is

Figure 2: Vibration monitoring locations for the motor generator in HETF II.



Location Key:

A - D : Measurements obtained on the steel mounting beam and the MGS subfloor nearby.

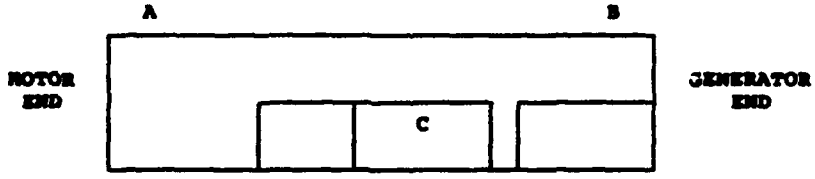
E - F : Measurements obtained on top of the MGS panels.

Table 5A: Measured vibration acceleration levels in HETF I on the new motor generator and the motor generator subfloor.

Measurement Position *	Measurement Condition	Measurement Location *Motor Generator*		*MGS Subfloor*	
		*** g RMS	*** g Peak	*** g RMS	*** g Peak
A	DC No Load	0.18	0.5	0.11	0.4
A	AC	0.12	0.4	ND	0.4
A**	AC	0.11	0.45	ND	0.3
B	DC No Load	ND	0.35	ND	0.35
B	AC	ND	0.4	0.11	0.45
B**	AC	ND	0.35	ND	0.4
C	DC No Load	0.28	0.8	0.25	0.5
C	AC	0.14	0.5	ND	0.4
C**	AC	0.24	0.7	0.12	0.55
D	DC No Load	0.14	0.8	ND	0.35
D	AC	ND	0.35	ND	0.45
D**	AC	ND	0.55	ND	0.45
E	DC No Load	0.14	0.6		
E	AC	0.18	0.7		
E**	AC	0.2	0.6		
F	DC No Load	0.26	1		
F	AC	0.26	1.2		
F**	AC	0.3	1.2		

* Measurement positions refer to Figure 1.
** Measurements obtained with pad mounts.
*** 1 g = 9.81 meters/sec2.
– ND = Non Detected.

Figure 3: Vibration monitoring locations for the motor generator in HETF II.



Location Key:

A & B - Measurements obtained on the steel mounting beam and the MGS subfloor nearby.

C - Measurments obtained on top of the MGS panel.

Table 5B: Measured vibration acceleration levels in HETF II on the new motor generator and the motor generator subfloor.

Measurement Position *	Measurement Condition	Measurement Location Motor Generator		MGS Subfloor	
		** g RMS	** g Peak	** g RMS	** g Peak
A	DC	0.2	0.6	ND	0.12
A	AC	0.12	0.55	ND	0.13
B	DC	0.2	1	0.3	ND
B	AC	0.4	1	ND	0.35
C	DC	0.28	0.9		
C	AC	0.2	0.65		

* Measurement positions refer to Figure 2.

** 1 g = 9.81 *meters/sec2*.

– ND = Non Detected.

simulated. It is not suspended from shock mounts as would be found in the SAC missile wings. The HETF I floor is hard mounted with steel beams on concrete pillars. This could have some effect on the floor vibration and thus the noise levels inside the HETF. Measurements in HETF I were performed without the MGS being bolted down to the subfloor as it actually would be. The result of each of these differences is likely to produce measured levels somewhat lower. However, the difference is difficult to quantify without actually having comparable measurements. Measurements in HETF II were also performed without the MGS being bolted to the subfloor, and the new MGS mounting incorporated the use of a small wooden block where there would normally be steel rails. This was necessary to accommodate the increased length of the new motor generator. The overall affect of these differences is anticipated to be insignificant for HETF II.

As indicated in the results section, the MGS in HETF II when operated alone very nearly met the PNC-50 criteria and exceeded it only at 125 Hz in AC operation. The MGS in HETF I on the other hand exceeded the criteria at 63 Hz under all conditions.

Another way to interpret the results is to look at the preferred speech interference levels (PSIL). PSIL in decibels is the arithmetic average of the levels of the four octave bands centered on the preferred frequencies 500, 1000, 2000, and 4000 Hz. Table 6 is a summary of the PSIL values for each HETF under all the measured conditions. USAFOEHL Report 85-075 recommended a PSIL of 51 dB in the small LCCs and 49 dB in the large LCC. The difference allows for the greater separation distance between the CC and DCC in the larger LCC. These PSIL values were determined as necessary to achieve a "normal voice" communication level between speaker and listener at the console separation distances. Table 6 shows the measured levels have PSILs which are always below these recommended levels when the new MGSs are operated alone in each HETF. The table also indicates the PSIL levels in both HETF I and HETF II are always above the recommended PSIL when only the ECS is running and when both the MGS and ECS are operating together.

Table 6: Summary of Preferred Speech Interference Levels (PSIL) in Hill Engineering Test Facilities I & II at the Commander's and Deputy Commander's consoles.

	MEASUREMENT LOCATION	MGS MODE	ECS MODE	PSIL (dB)	
				OLD **	NEW **
HETF I	CC	AC	OFF	48.4	46.1
	DCC	AC	OFF	48.6	46.4
	CC *	AC	OFF	NO	41.5
	DCC *	AC	OFF	NO	43.9
	CC	DC	OFF	NO	45.8
	DCC	DC	OFF	NO	43.2
	CC	OFF	DC	63.6	64.5
	DCC	OFF	DC	66.3	66.1
	CC	OFF	AC	55.9	56
	DCC	OFF	AC	55.4	55.6
	CC	AC	AC	59.1	57.6
	DCC	AC	AC	58.6	56.6
	CC	DC	DC	64.6	64.1
	DCC	DC	DC	66	66.1
	CC *	AC	AC	NO	57
	DCC *	AC	AC	NO	56.3
HETF II	CC	AC	OFF	48.1	37.1
	DCC	AC	OFF	45.7	38.7
	CC	DC	OFF	NO	37.7
	DCC	DC	OFF	NO	39.9
	CC	OFF	AC	51.2	51.8
	DCC	OFF	AC	53.3	54.2
	CC	DC	DC	52.8	52.2
	DCC	DC	DC	55.4	54.5
	CC	AC	AC	54.3	54.2
	DCC	AC	AC	56.1	55.2

* Measurements made with pad mounts installed.

** Refers to MGS type.

'NO' – Data not obtained.

2. Intensity

The calculation of the transmission loss of the floor panels should have provided close to the same results in each octave band regardless of the measurement conditions since steps were taken to plug and cover all unnecessary holes in the floor panels. Thus we should have seen the same results whether we measured the old or new MGS, under AC or DC operation, in either HETF. Although we are convinced the results for this survey are better than those obtained with the survey technique used in the 1984 surveys, these results indicate there may still be some flaws in our survey technique. Ideally we should have measured the floor transmission loss with only the MGS operating and all other sources of noise turned off. This would have eliminated some of the interference. Since the MGS could only be operated for ten minutes at a time without cooling air, we performed the intensity measurements with all systems operating. The data results show sources other than the MGS dominate the intensity levels at certain frequencies six inches above the floor when the floor panels are in place.

The decibel transmission losses in the mid frequencies as measured on this survey average in the low to mid 20's. The "ideal value" for transmission loss of 1/4" thick steel with a surface weight of 10 pounds per square foot (lbs/ft^2) in the mid frequency range should be about 40 dB, as indicated in Table 4. The fact we only measured about 20 dB less than the reported attenuation 1/4" thick steel provides is a strong indication of the presence of significant paths of structure-borne energy contributing to the acoustic environment in the LCC.

3. Vibration

A comparison of the vibration measurements on the steel mounting beam versus the subfloor indicates generally there was insignificant vibration reduction from the MGS unit itself to the floor it rests on. Vibration energy from the MGS was being directly transmitted into the subfloor where it was carried through steel structures to all parts of the LCC. This increased the acoustic levels inside the LCC. There was also significant vibration on the tops of the MGS panels. The acoustic energy radiated from these vibrating panels and other leaks in the MGS, would be insignificant if the MGS was properly vibration isolated. The acoustic attenuation of the floor panels would be adequate under ideal conditions to reduce these sources of acoustic energy.

III. CONCLUSIONS

The new motor generator system as configured in HETF I did not meet the PNC-50 criteria. A strong 63 Hz component existed in the frequency spectrum for both AC and DC operation as measured at the CC and DCC. Our survey measurements indicated the source of the 63 Hz signal was the new MGS and it was 10 dB higher than the PNC-50 criteria for that frequency.

The new motor generator system as configured in HETF II does not meet the PNC-50 criteria, but the problem was not nearly so serious as in HETF I. The criteria is exceeded only on AC operation in one octave band by 3 dB.

The floor panel ideal transmission loss was negated by significant paths of structure-borne vibration energy contributing to the LCC noise environment.

The preferred speech interference levels, a measure of the quality of person-to-person voice communication, in each LCC were below the recommended levels for the new MGSs, but only when all other noise sources in the LCC were turned off. The recommended PSILs were exceeded whenever the ECS was operating.

All results indicate the ECS was a major secondary source of noise in the LCCs. Under DC operation in HETF I, the ECS operating alone exceeded the PNC-50 criteria by over 20 dB in the 1 kHz and 2 kHz octave bands. Any benefits of noise reduction in the MGSs will never be fully realized in the LCCs until the noise output from the ECS is also reduced to the PNC-50 levels.

Placing pad mounts in HETF I produced no significant reduction in acoustic levels in the LCCs. The results in terms of recorded levels may be somewhat in error since the survey was conducted without the MGS being bolted down to the subfloor, but we believe the conclusion is still appropriate. Securing the MGS to the subfloor with bolts will simply provide a better transmission path of vibration energy from the MGS to the metal structure of the LCCs. As a result we would expect slightly higher noise levels to be present in the LCCs under these conditions.

IV. RECOMMENDATIONS

The new motor generator system as configured in HETF I should not be accepted until modifications can reduce or eliminate the strong 63 Hz signal present when this MGS operates. The PNC-50 criteria should continue to be used as the performance design goal. Since the new MGS as configured in HETF II was so close to meeting the PNC-50 criteria, it may not be mandatory to make acoustic modifications. However, if design modifications to reduce noise for the MGS in HETF I prove successful, we recommend you apply the same modifications to the MGS in the HETF II configuration as well. As these new MGSs are used over the next 20 years in the SAC missile wings some performance degradation may increase the noise output. Having noise controls incorporated into the initial design will help eliminate the need for future retrofit projects.

Although the PSIL results indicate acceptable levels for satisfactory person-to-person voice communication is possible in the LCCs with only the new MGSs operating, we do not advocate using the PSIL criteria instead of the PNC-50 criteria as your performance design goal. The significant low frequency contribution from the new MGS is not considered in the PSIL. Long durations of continuous exposure to moderately high, low frequency noise can be very fatiguing, just as long duration flights in particularly noisy aircraft can have a draining effect. SAC missile crews must spend a minimum of 24 hours and sometimes several days in the LCCs on alert and are expected to remain at their peak performance level. The annoying and fatiguing nature of long term exposure to low frequency noise can be expected to degrade the crew's job performance. Therefore, we recommend you stick with the PNC-50 criteria for the new MGSs since it incorporates an acceptable low frequency limit.

We recommend reaccomplishing the intensity portion of this survey when the final qualifications tests are performed to establish a more exact floor transmission loss. We propose surveying the MGS with both the floor panels removed and in place and all other equipment turned off.

The ECS in both LCCs is a major source of high frequency noise which by itself causes the desired acoustic levels in the LCCs to be exceeded. Since none of the noise reduction benefits achieved in the new MGSs will be realized until the ECS noise is reduced, we recommend a phased approach to noise reduction in the LCCs begin now. The ECS may be old enough now to be considered for replacement just as the MGS was. If this is the case, the same acoustic performance criteria should be placed on a newly designed ECS as was used for the MGS. In this way the MGS can be kept from once again becoming the major noise source once other noise sources have been reduced. Industrial Acoustics Company (IAC) is now advertising ultra-quite, energy-efficient air handling units which meet the NC-55 criteria. IAC will design the units to meet the user's specific air handling and space requirements. IAC's address is: 1160 Commerce Avenue, Bronx, New York 10462, phone: (212) 931-8000. In the meantime you may wish to consider several noise reduction alternatives for the ECS. The problem seems to stem primarily from the flow rate of air through the system. You can slow the airflow by reducing the fan speed, and if necessary run the air at a lower temperature to maintain the same level of cooling for the equipment.

To reduce the transmission of structure-borne vibration energy from the motor generator we recommend vibration isolation mounts of the unhoused spring isolator design (see Figure 4) for the MGS. Resilient snubbing devices (see Figure 5) should be used for restricting the MGS motion during start-up. Alternatively, various types of seismic restraining devices (Figures 6 and 7) may be used to satisfy the hardness issues. We recognize the extremely restrictive load requirements for the LCC floor may limit the additional weight you can add to the floor, but we do not believe the structure-borne vibration problem can be resolved without the use of spring isolators. This was evident from the measurements made in HETF I using the "approved" pad mounts under the MGS frame. Complete vibration isolation of the MGS from the floor must be accomplished.

An alternative mounting arrangement for the motor generator would be to disconnect it from the shock isolated floor. A properly designed and engineered mounting scheme which would have the MGS seismically mounted in the same position but physically attached to the outer shell of the LCC should eliminate the vibration transmission problems. It would also reduce the load on the shock isolated floor. Of course any new mounting scheme would have to pass all the hardness criteria.

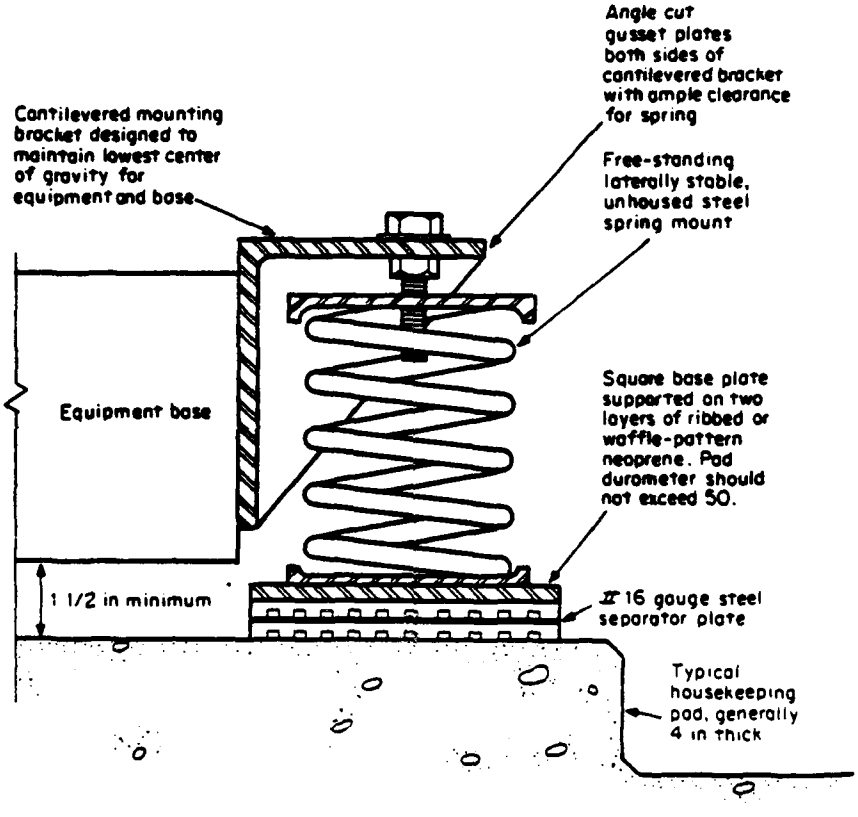


Figure 4: Recommended vibration isolator detail for cantilevered bracket and open spring isolator.[3]

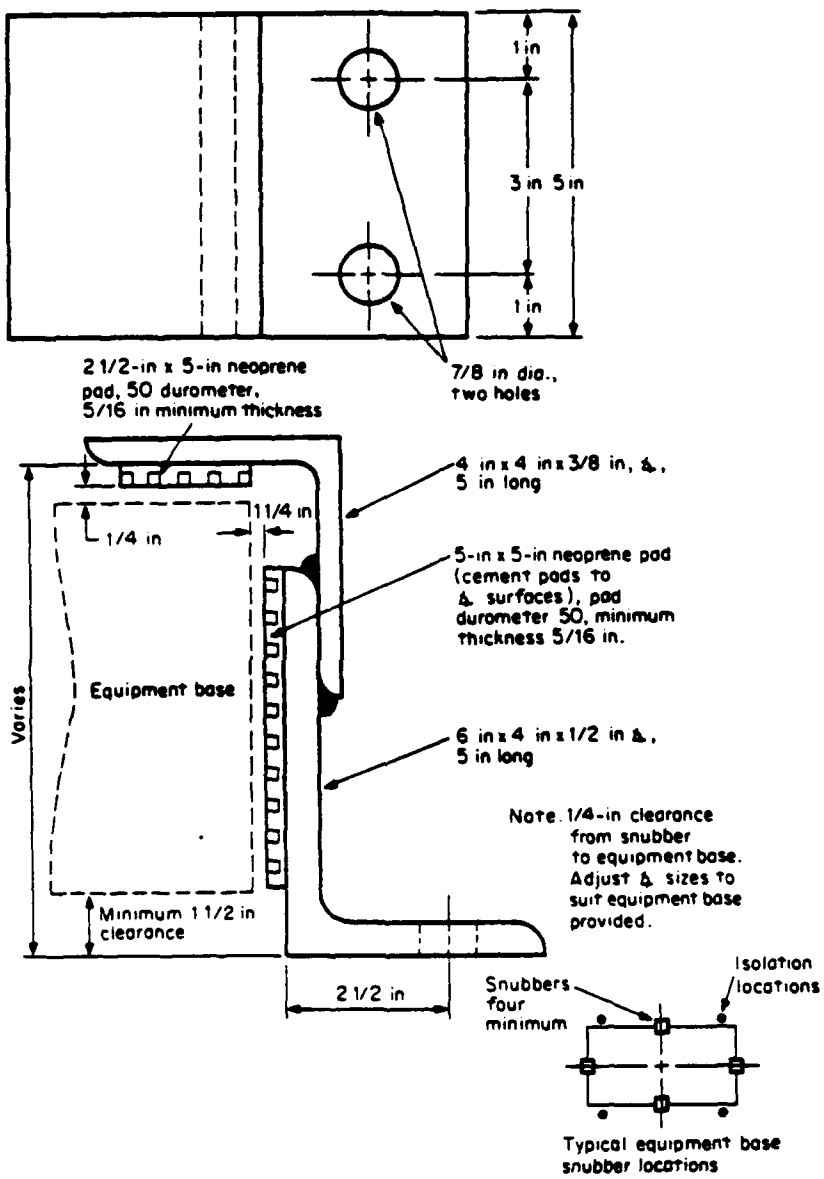
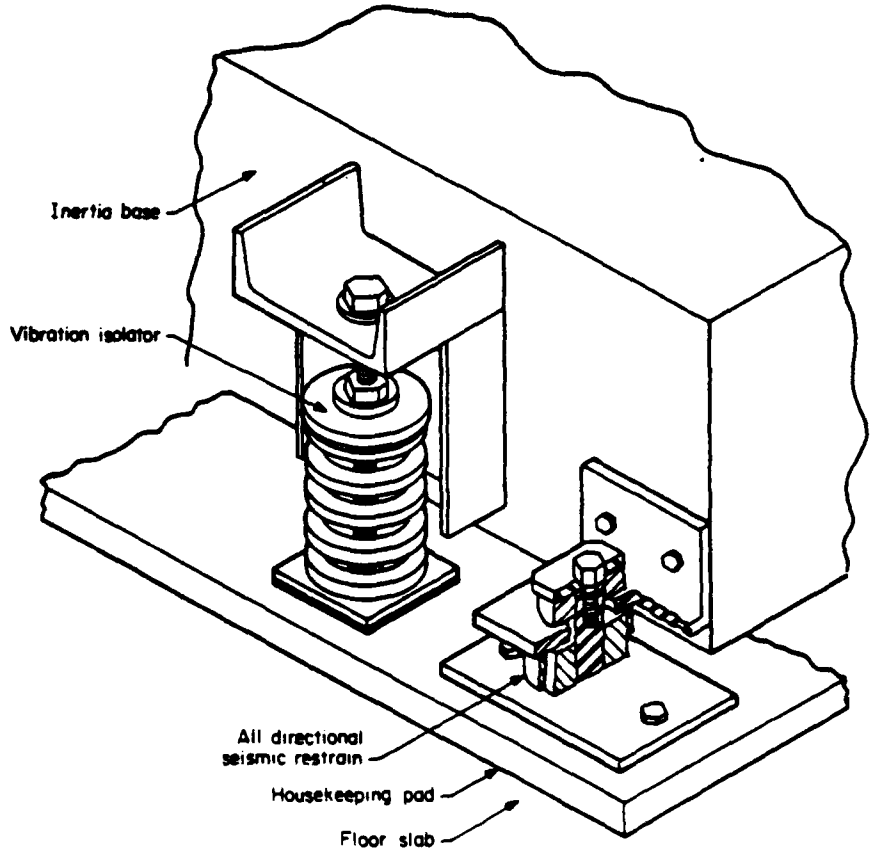


Figure 5: Resilient snubbing unit.[3]



Feature Passive snubber type restraint consists of elastomeric pads and bushings interposed between welded steel housings
Mounting configuration For side mount to equipment base.
Application For seismic zones 1 and 2 and to some extent zone 3.

Figure 6: All-directional seismic restraint.[3]

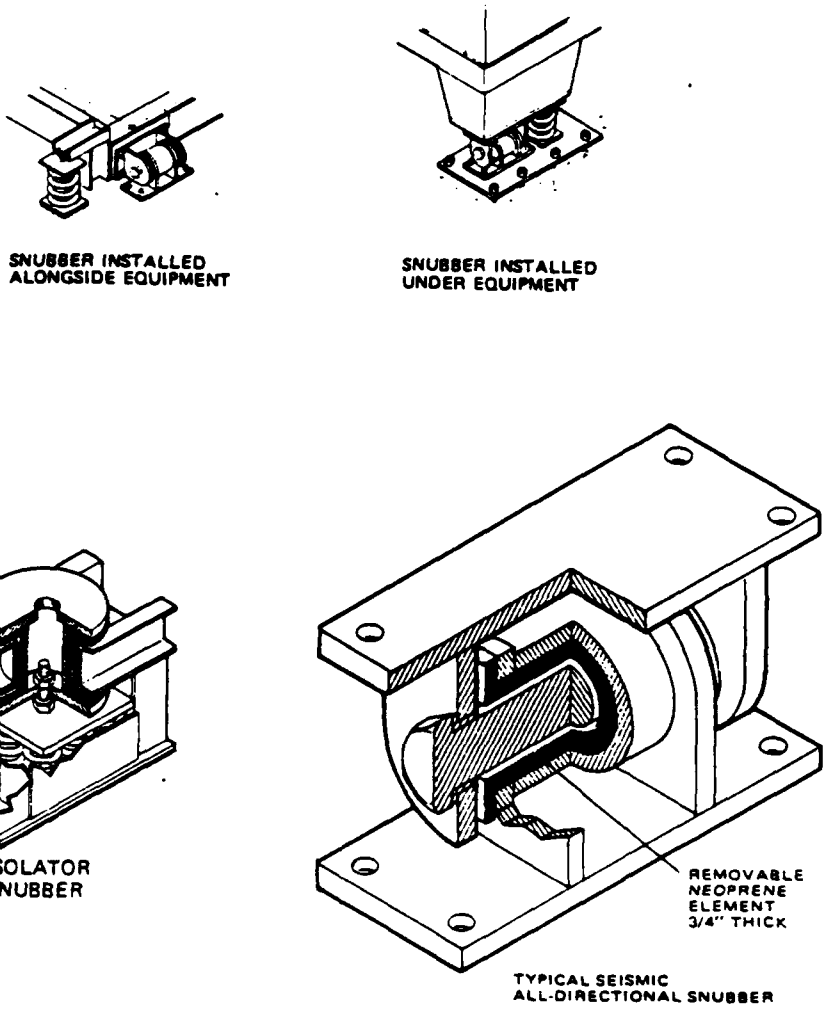


Figure 7: Typical snubbers and installation examples.[3]

References

1. AFR 161-35, Hazardous Noise Exposure (9 April 1982)

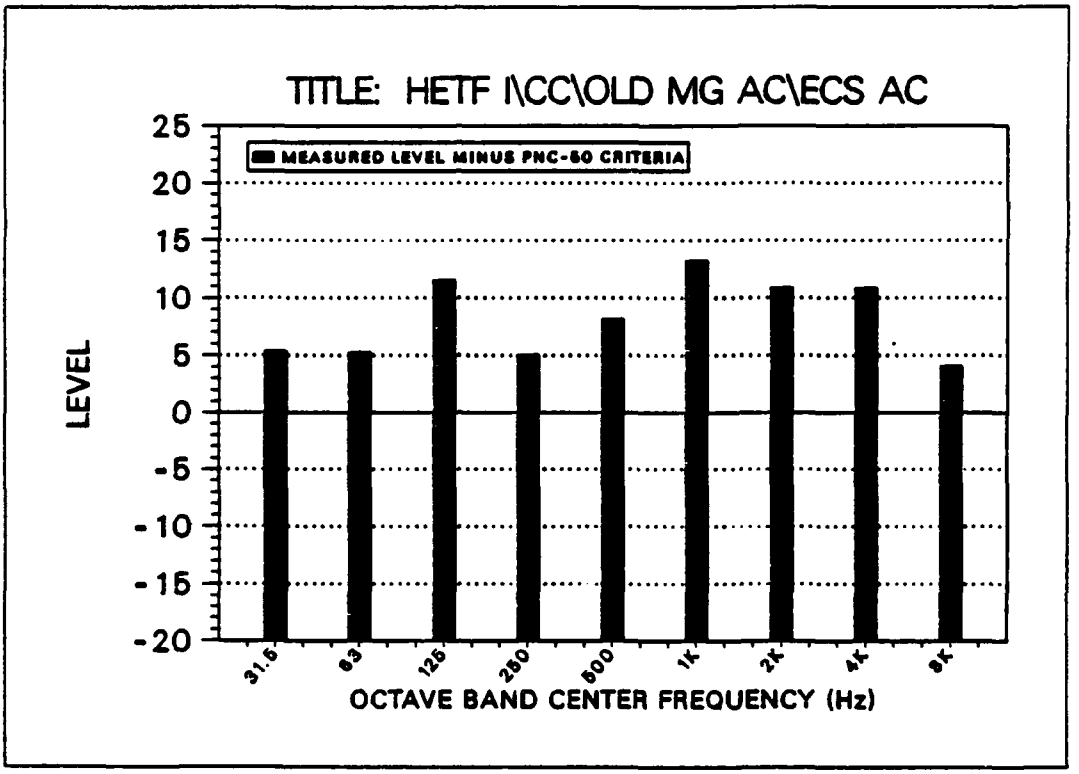
2. Bell, Lewis H., Industrial Noise Control. New York: Marcell Dekker, Inc., (1982)

3. Jones, Robert F., Noise and Vibration Control in Buildings. New York: McGraw-Hill Inc., (1984)

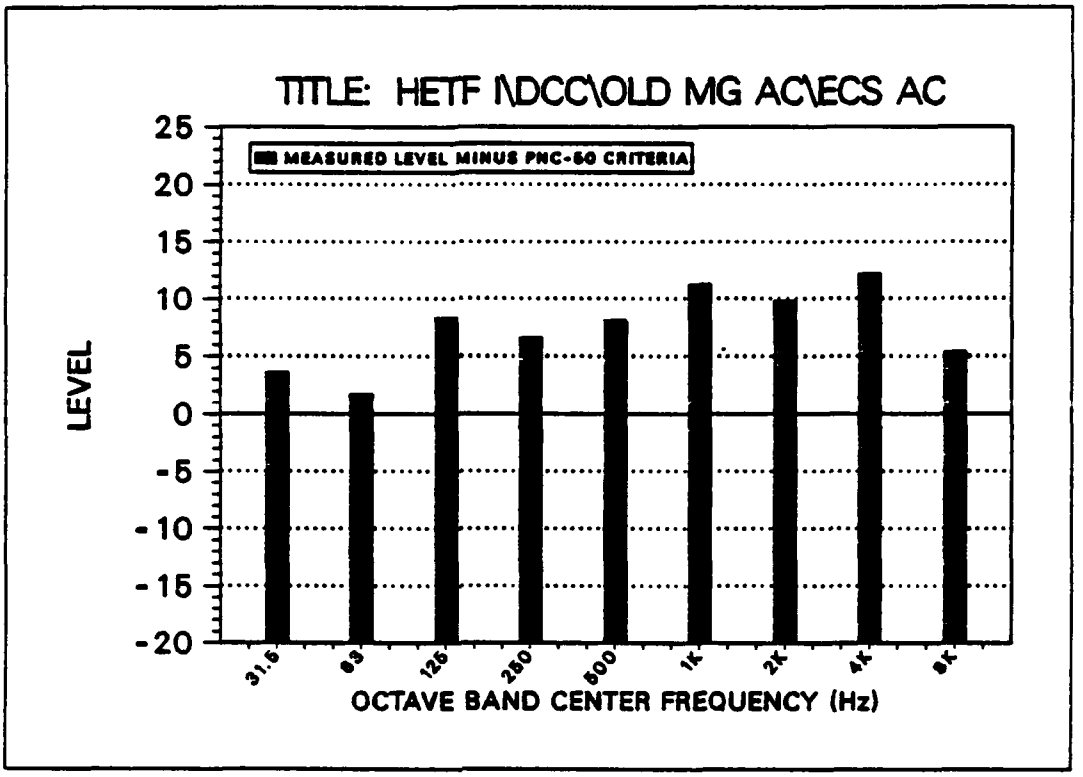
APPENDIX A

Performance Measurements at the Crew Positions

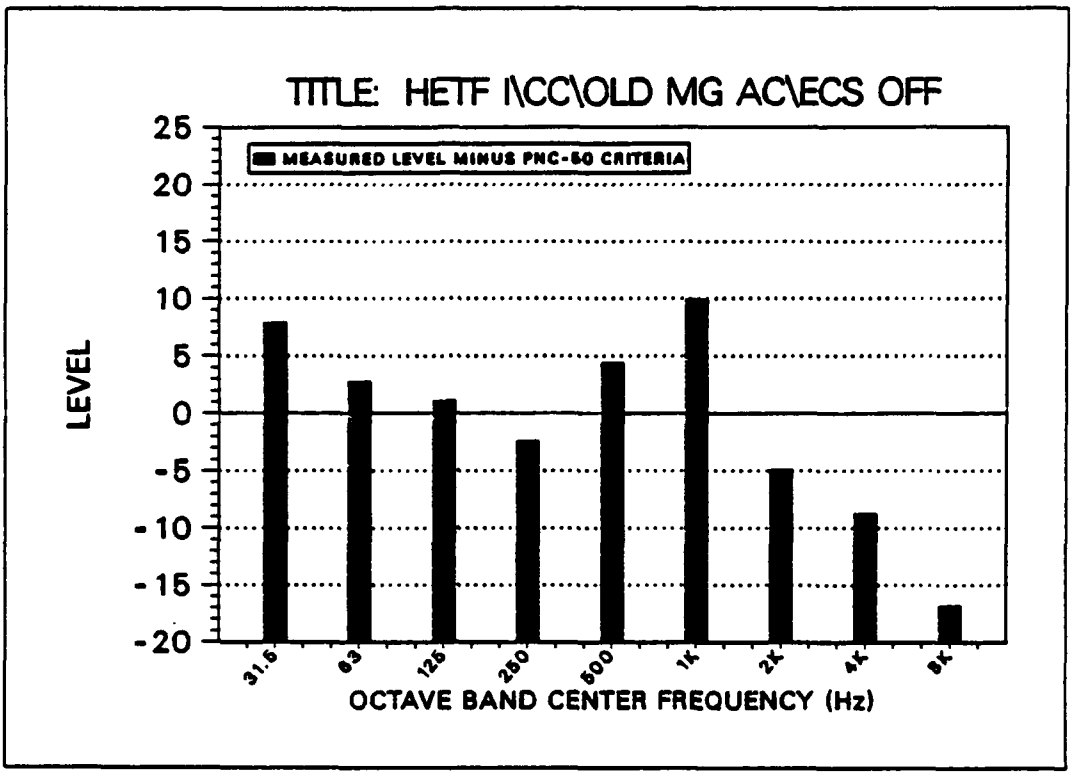
(This page left blank)



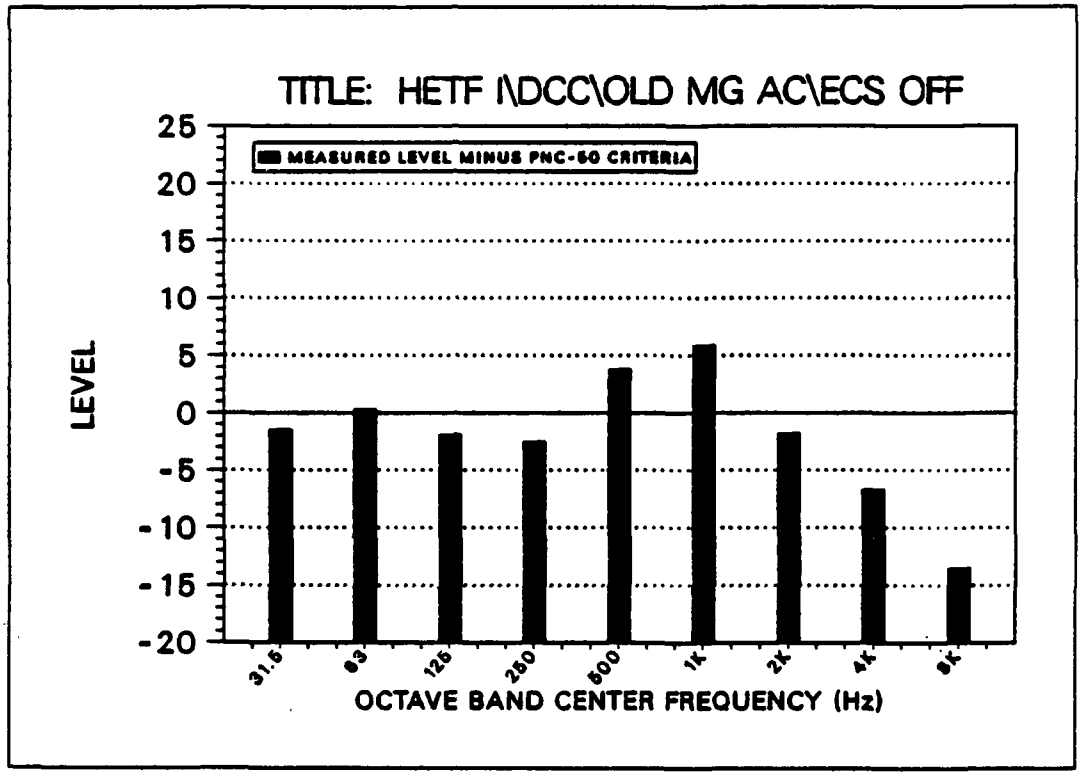
FREQ (Hz)	OCTAVE BAND SPL (dB)	PNC-50 CRITERIA (dB)	MEASURED LEVEL MINUS PNC-50 (dB)
31.5	75.4	70	5.4
63	71.3	66	5.3
125	73.6	62	11.6
250	63.1	58	5.1
500	62.2	54	8.2
1,000	63.2	50	13.2
2,000	56.9	46	10.9
4,000	53.9	43	10.9
8,000	47.1	43	4.1



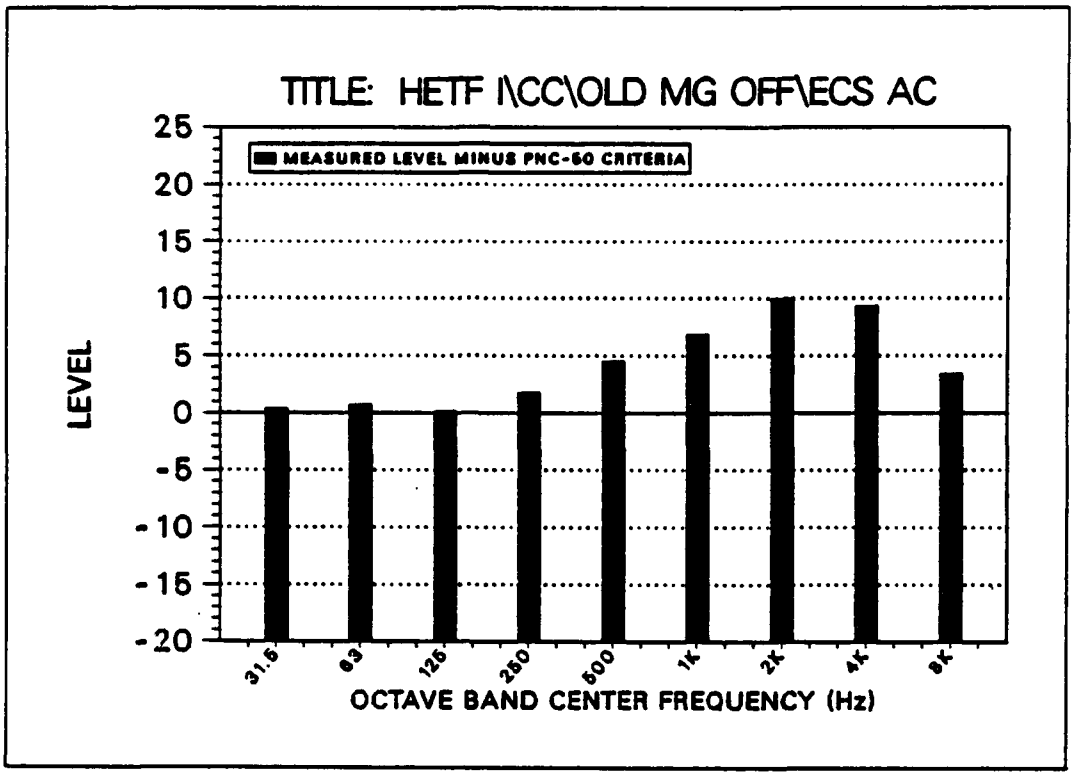
FREQ (Hz)	OCTAVE BAND SPL (dB)	PNC-50 CRITERIA (dB)	MEASURED LEVEL MINUS PNC-50 (dB)
31.5	73.6	70	3.6
63	67.7	66	1.7
125	70.3	62	8.3
250	64.6	58	6.6
500	62.1	54	8.1
1,000	61.3	50	11.3
2,000	55.8	46	9.8
4,000	55.2	43	12.2
8,000	48.4	43	5.4



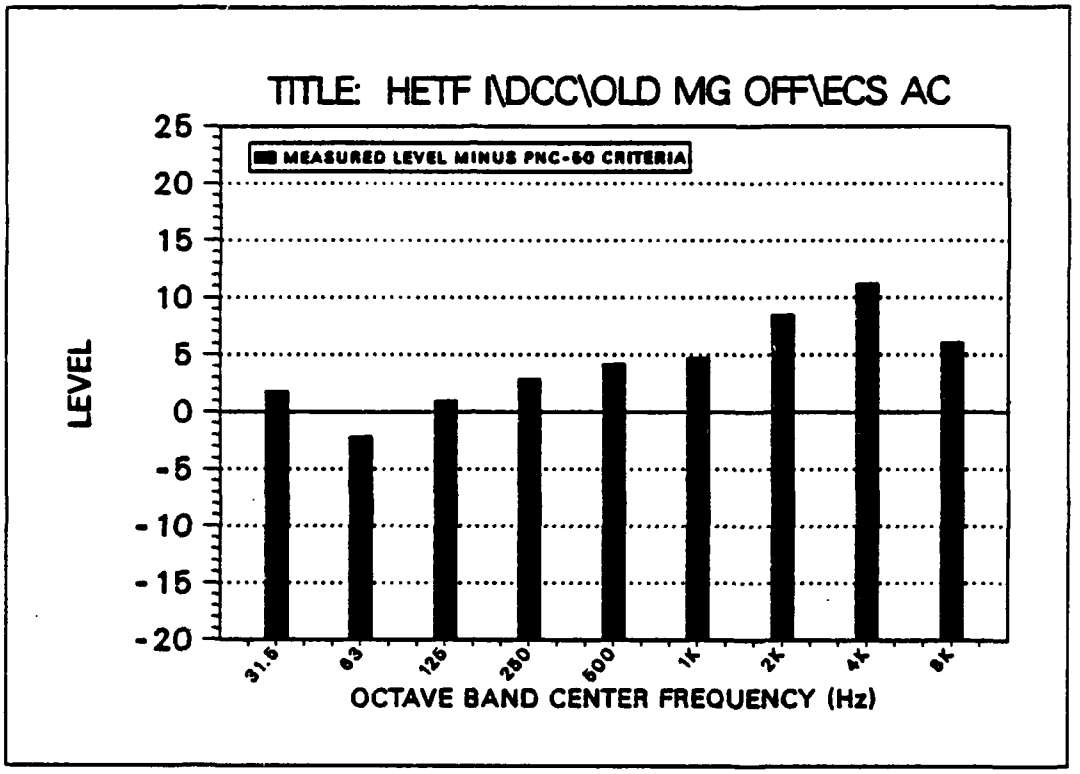
FREQ (Hz)	OCTAVE BAND SPL (dB)	PNC-50 CRITERIA (dB)	MEASURED LEVEL MINUS PNC-50 (dB)
31.5	77.9	70	7.9
63	68.8	66	2.8
125	63.1	62	1.1
250	55.6	58	-2.4
500	58.4	54	4.4
1,000	59.9	50	9.9
2,000	41.1	46	-4.9
4,000	34.3	43	-8.7
8,000	26.2	43	-16.8



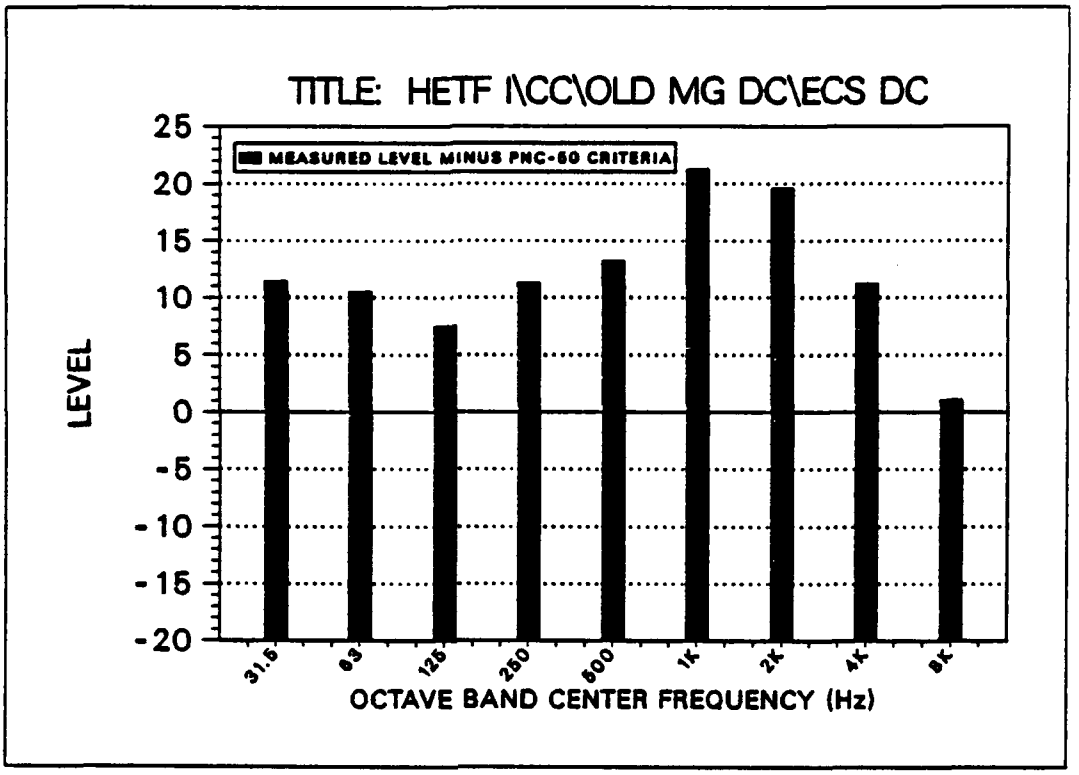
FREQ (Hz)	OCTAVE BAND SPL (dB)	PNC-50 CRITERIA (dB)	MEASURED LEVEL MINUS PNC-50 (dB)
31.5	68.5	70	−1.5
63	66.3	66	0.3
125	60.1	62	−1.9
250	55.5	58	−2.5
500	57.8	54	3.8
1,000	55.9	50	5.9
2,000	44.2	46	−1.8
4,000	36.3	43	−6.7
8,000	29.5	43	−13.5



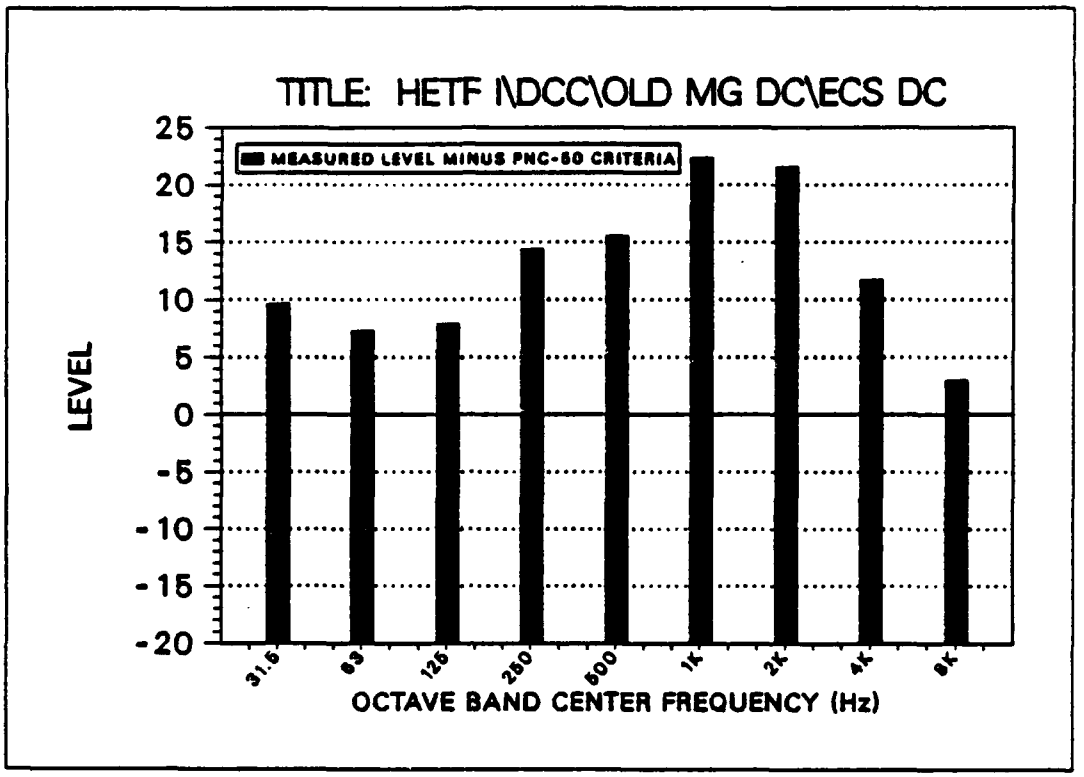
FREQ (Hz)	OCTAVE BAND SPL (dB)	PNC-60 CRITERIA (dB)	MEASURED LEVEL MINUS PNC-60 (dB)
31.5	70.4	70	0.4
63	66.7	66	0.7
125	62.2	62	0.2
250	59.8	58	1.8
500	58.5	54	4.5
1,000	56.9	50	6.9
2,000	56	46	10
4,000	52.3	43	9.3
8,000	46.4	43	3.4



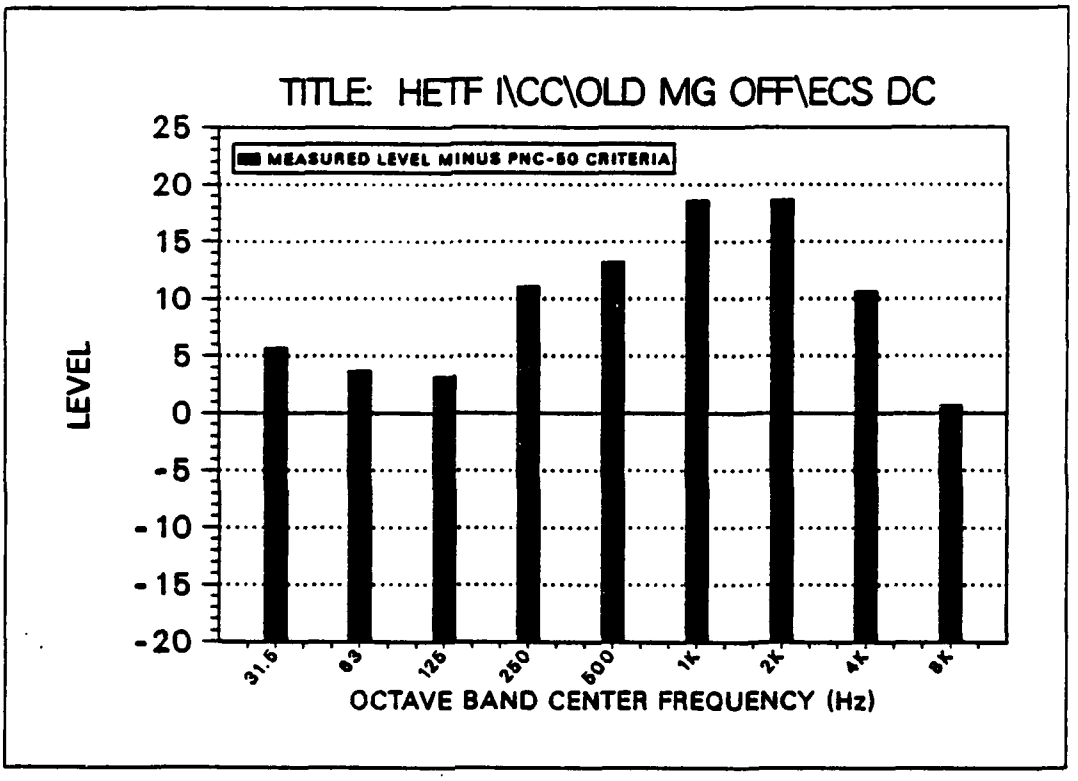
FREQ (Hz)	OCTAVE BAND SPL (dB)	PNC-60 CRITERIA (dB)	MEASURED LEVEL MINUS PNC-60 (dB)
31.5	71.8	70	1.8
63	63.8	66	-2.2
125	63	62	1
250	60.9	58	2.9
500	58.2	54	4.2
1,000	54.7	50	4.7
2,000	54.5	46	8.5
4,000	54.2	43	11.2
8,000	49.1	43	6.1



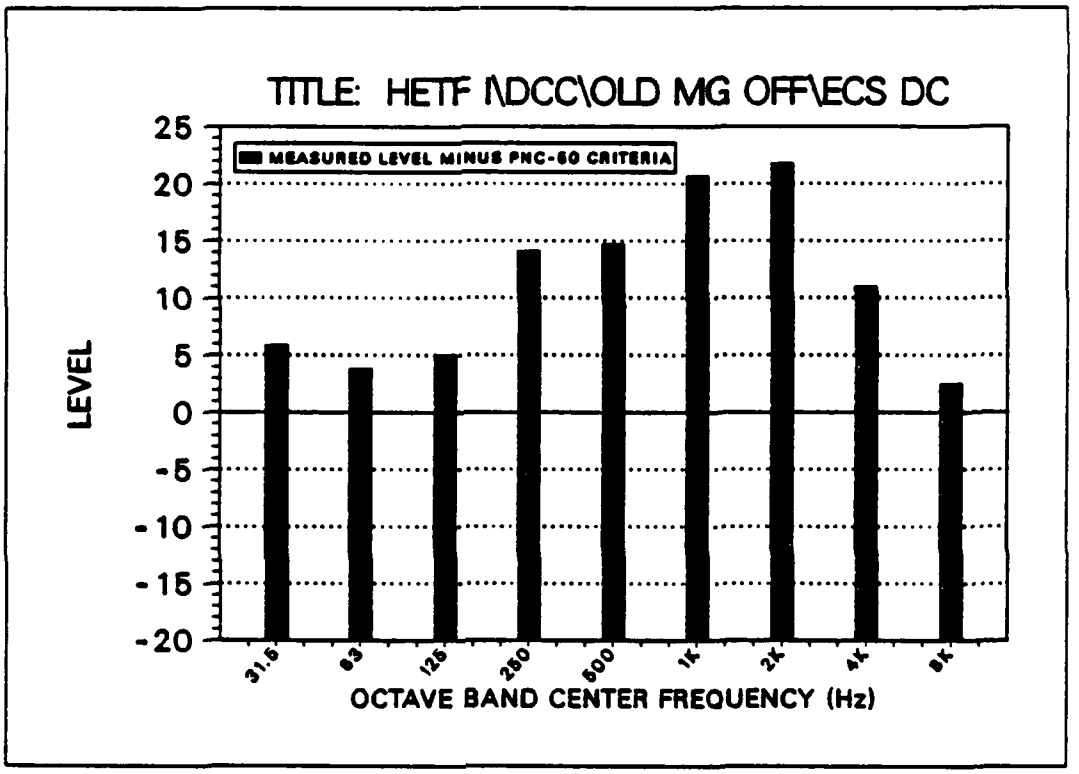
FREQ (Hz)	OCTAVE BAND SPL (dB)	PNC-50 CRITERIA (dB)	MEASURED LEVEL MINUS PNC-50 (dB)
31.5	81.4	70	11.4
63	76.5	66	10.5
125	69.5	62	7.5
250	69.3	58	11.3
500	67.2	54	13.2
1,000	71.3	50	21.3
2,000	65.6	46	19.6
4,000	54.2	43	11.2
8,000	44.1	43	1.1



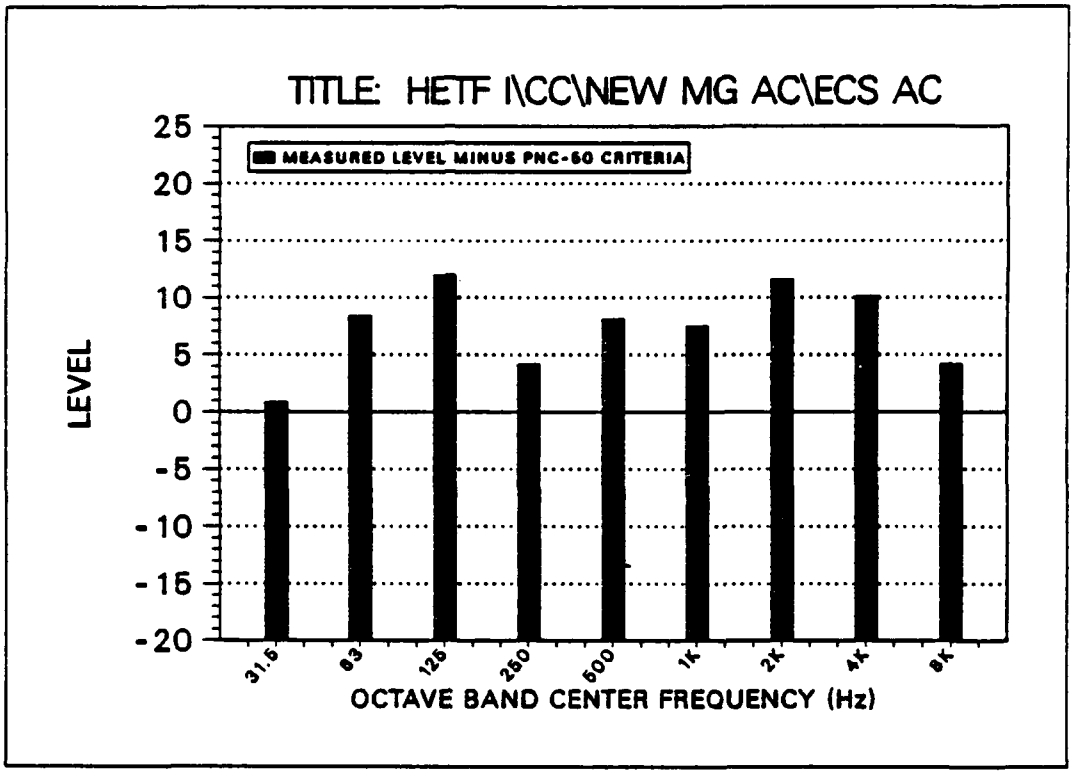
FREQ (Hz)	OCTAVE BAND SPL (dB)	PNC-50 CRITERIA (dB)	MEASURED LEVEL MINUS PNC-50 (dB)
31.5	79.6	70	9.6
63	73.3	66	7.3
125	69.9	62	7.9
250	72.4	58	14.4
500	69.5	54	15.5
1,000	72.3	50	22.3
2,000	67.6	46	21.6
4,000	54.7	43	11.7
8,000	46	43	3



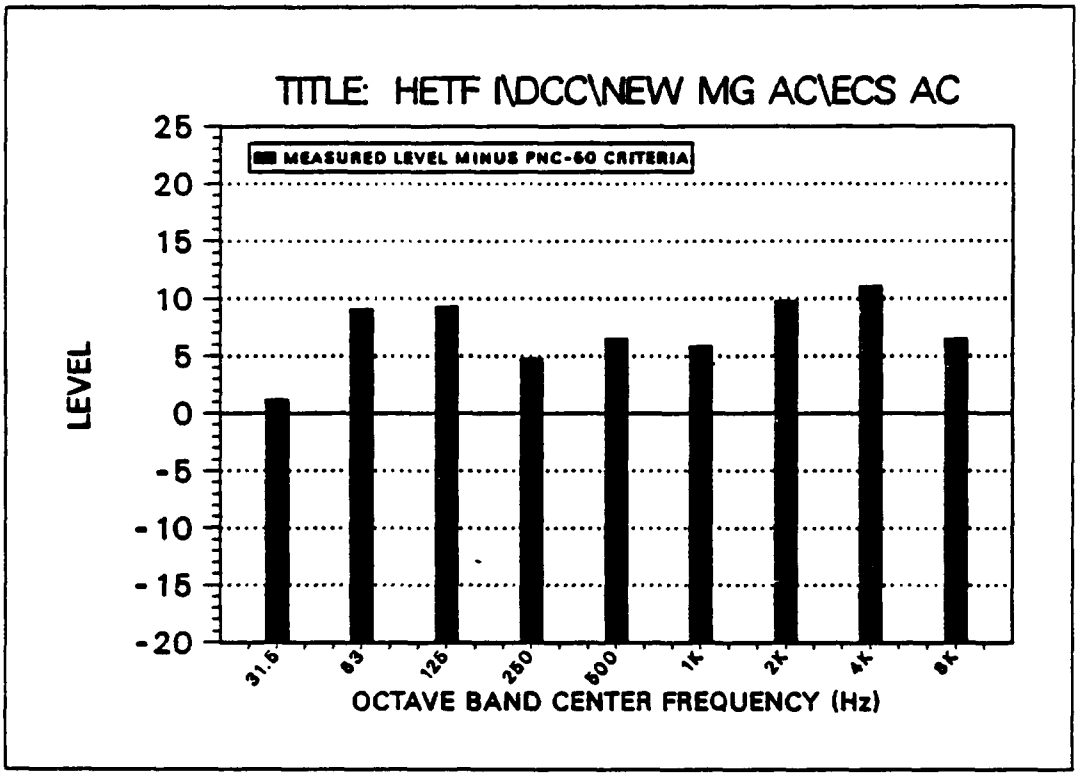
FREQ (Hz)	OCTAVE BAND SPL (dB)	PNC-50 CRITERIA (dB)	MEASURED LEVEL MINUS PNC-50 (dB)
31.5	75.7	70	5.7
63	69.7	66	3.7
125	65.2	62	3.2
250	69.1	58	11.1
500	67.2	54	13.2
1,000	68.6	50	18.6
2,000	64.7	46	18.7
4,000	53.7	43	10.7
8,000	43.7	43	0.7



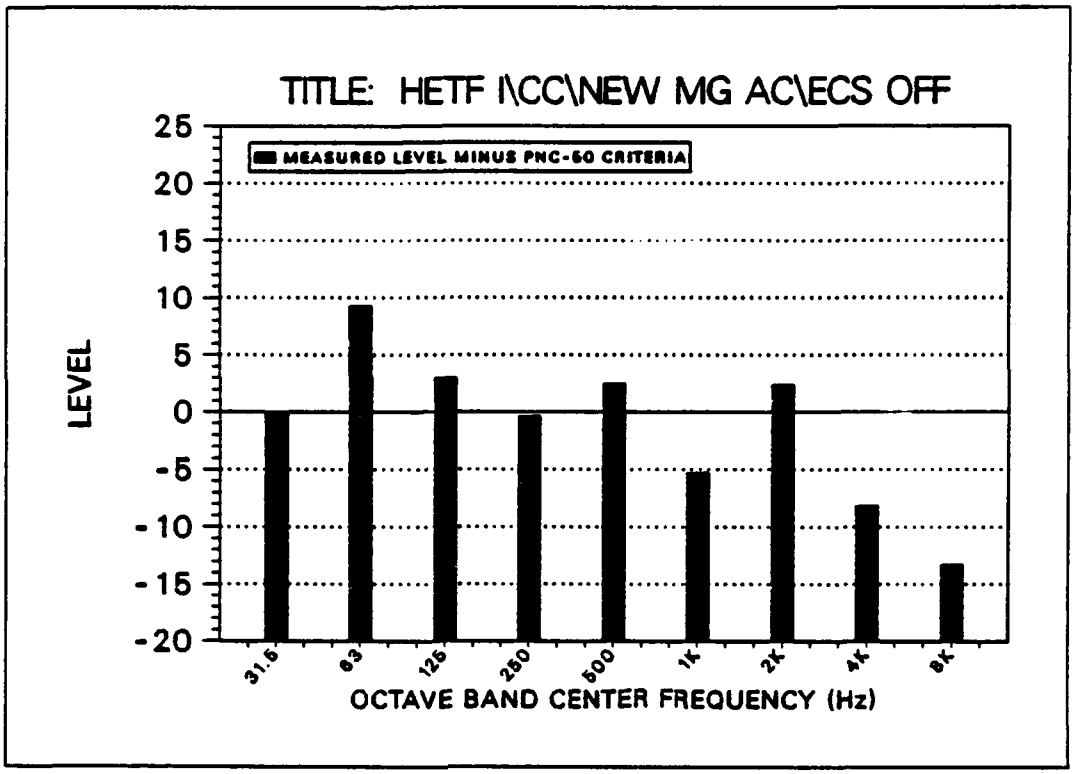
FREQ (Hz)	OCTAVE BAND SPL (dB)	PNC-50 CRITERIA (dB)	MEASURED LEVEL MINUS PNC-50 (dB)
31.5	75.9	70	5.9
63	69.8	66	3.8
125	67	62	5
250	72.1	58	14.1
500	68.7	54	14.7
1,000	70.7	50	20.7
2,000	67.8	46	21.8
4,000	54	43	11
8,000	45.5	43	2.5



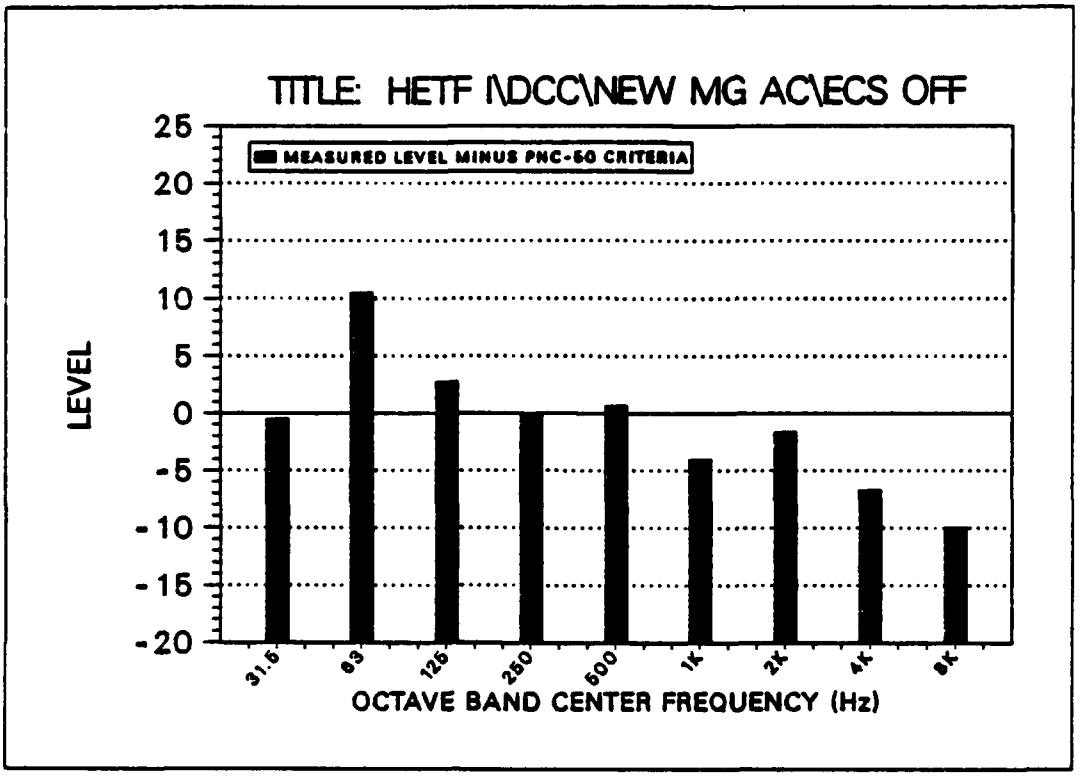
FREQ (Hz)	OCTAVE BAND SPL (dB)	PNC-60 CRITERIA (dB)	MEASURED LEVEL MINUS PNC-60 (dB)
31.5	70.9	70	0.9
63	74.4	66	8.4
125	74	62	12
250	62.2	58	4.2
500	62.1	54	8.1
1,000	57.5	50	7.5
2,000	57.6	46	11.6
4,000	53.1	43	10.1
8,000	47.2	43	4.2



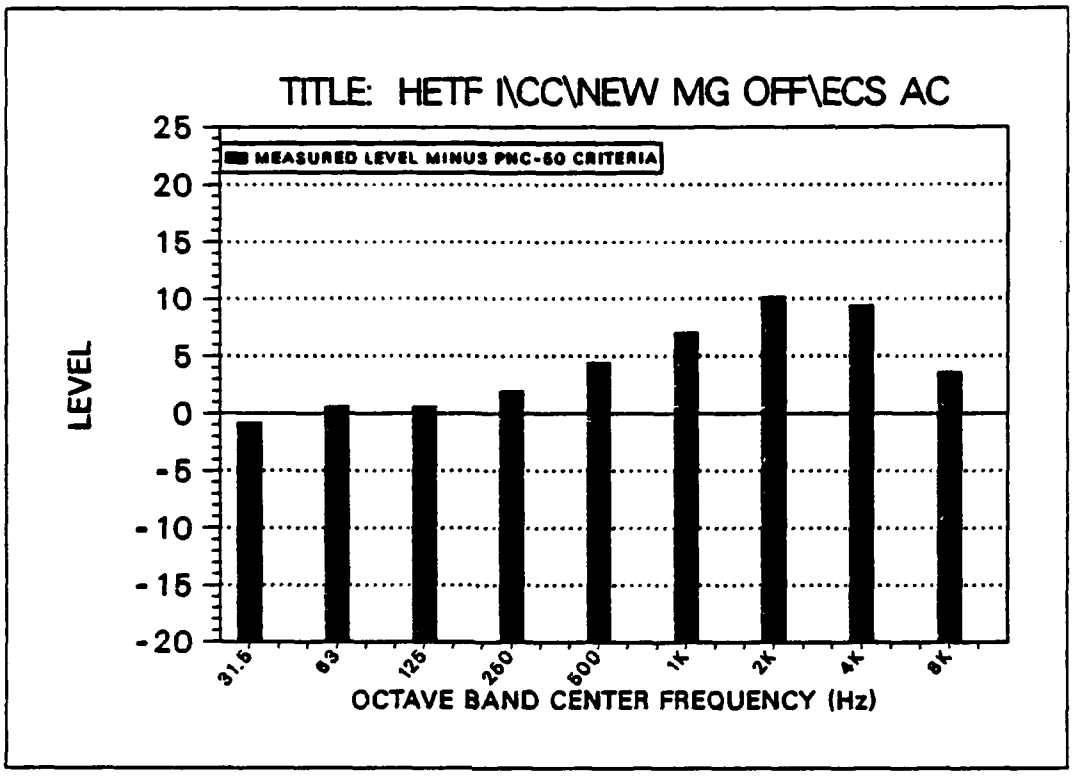
FREQ (Hz)	OCTAVE BAND SPL (dB)	PNC-60 CRITERIA (dB)	MEASURED LEVEL MINUS PNC-60 (dB)
31.5	71.2	70	1.2
63	75.1	66	9.1
125	71.3	62	9.3
250	62.8	58	4.8
500	60.5	54	6.5
1,000	55.9	50	5.9
2,000	55.8	46	9.8
4,000	54.1	43	11.1
8,000	49.5	43	6.5



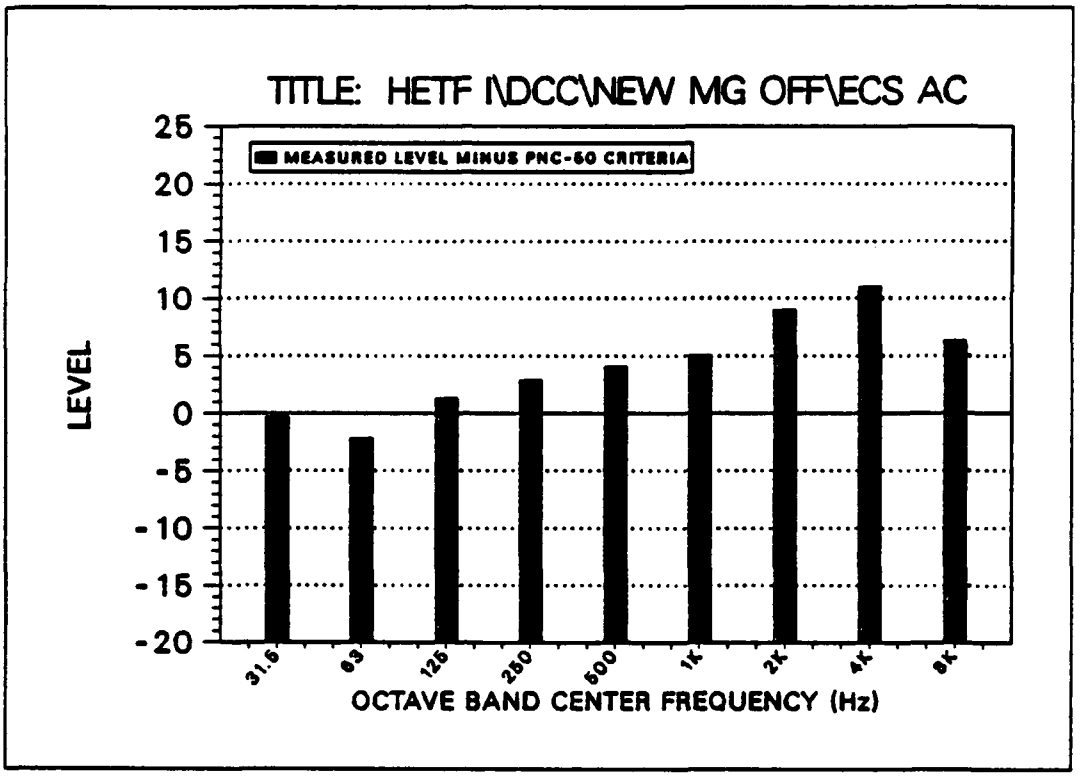
FREQ (Hz)	OCTAVE BAND SPL (dB)	PNC-60 CRITERIA (dB)	MEASURED LEVEL MINUS PNC-60 (dB)
31.5	69.9	70	−0.1
63	75.3	66	9.3
125	65	62	3
250	57.6	58	−0.4
500	56.5	54	2.5
1,000	44.7	50	−5.3
2,000	48.4	46	2.4
4,000	34.8	43	−8.2
8,000	29.7	43	−13.3



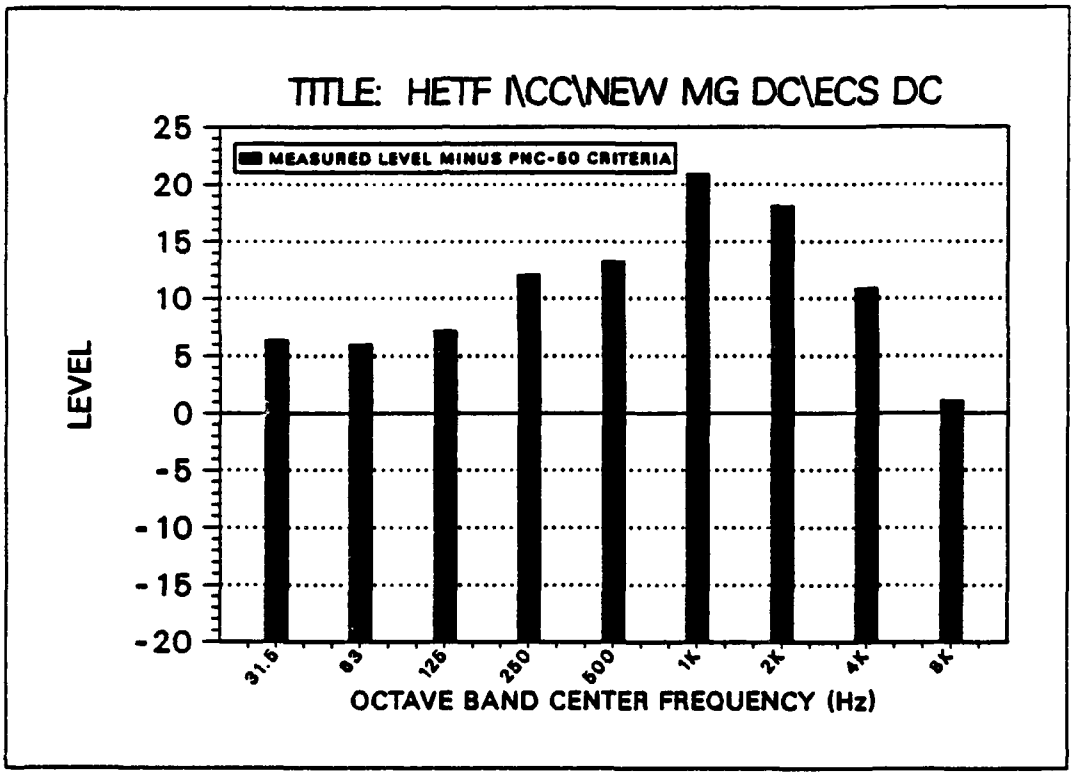
FREQ (Hz)	OCTAVE BAND SPL (dB)	PNC-60 CRITERIA (dB)	MEASURED LEVEL MINUS PNC-60 (dB)
31.5	69.5	70	−0.5
63	76.5	66	10.5
125	64.8	62	2.8
250	57.8	58	−0.2
500	54.7	54	0.7
1,000	46	50	−4
2,000	44.4	46	−1.6
4,000	36.3	43	−6.7
8,000	33	43	−10



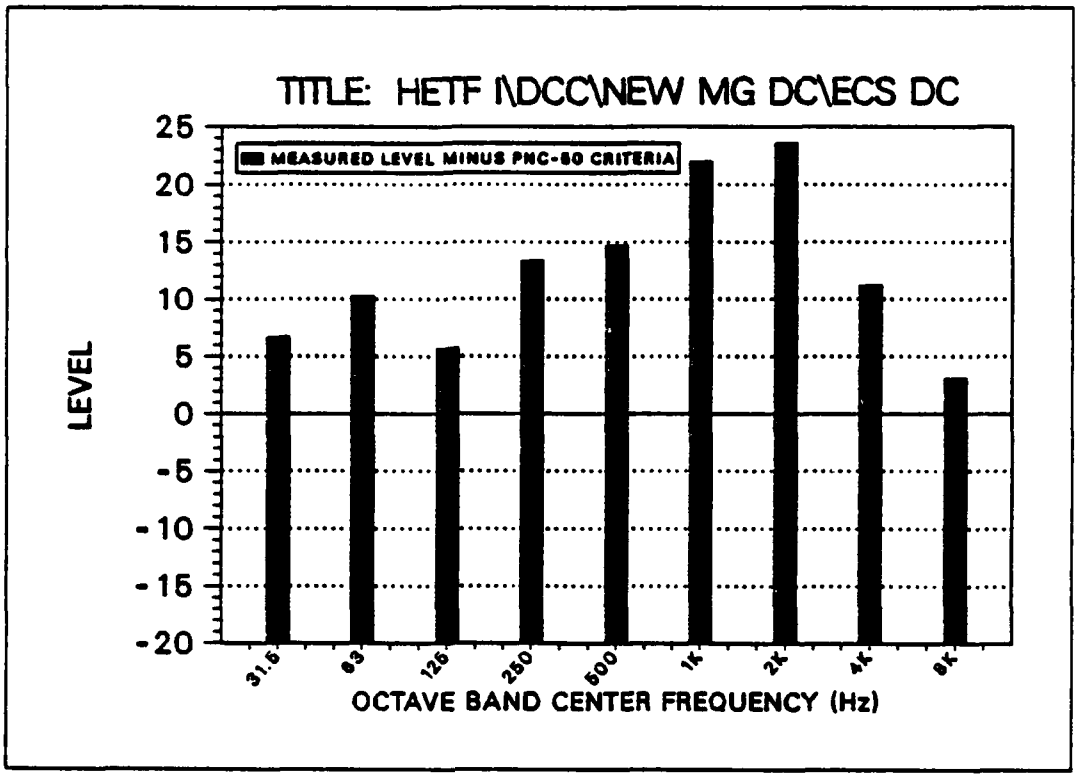
FREQ (Hz)	OCTAVE BAND SPL (dB)	PNC-50 CRITERIA (dB)	MEASURED LEVEL MINUS PNC-50 (dB)
31.5	69.2	70	−0.8
63	66.6	66	0.6
125	62.6	62	0.6
250	60	58	2
500	58.4	54	4.4
1,000	57	50	7
2,000	56.2	46	10.2
4,000	52.4	43	9.4
8,000	46.6	43	3.6



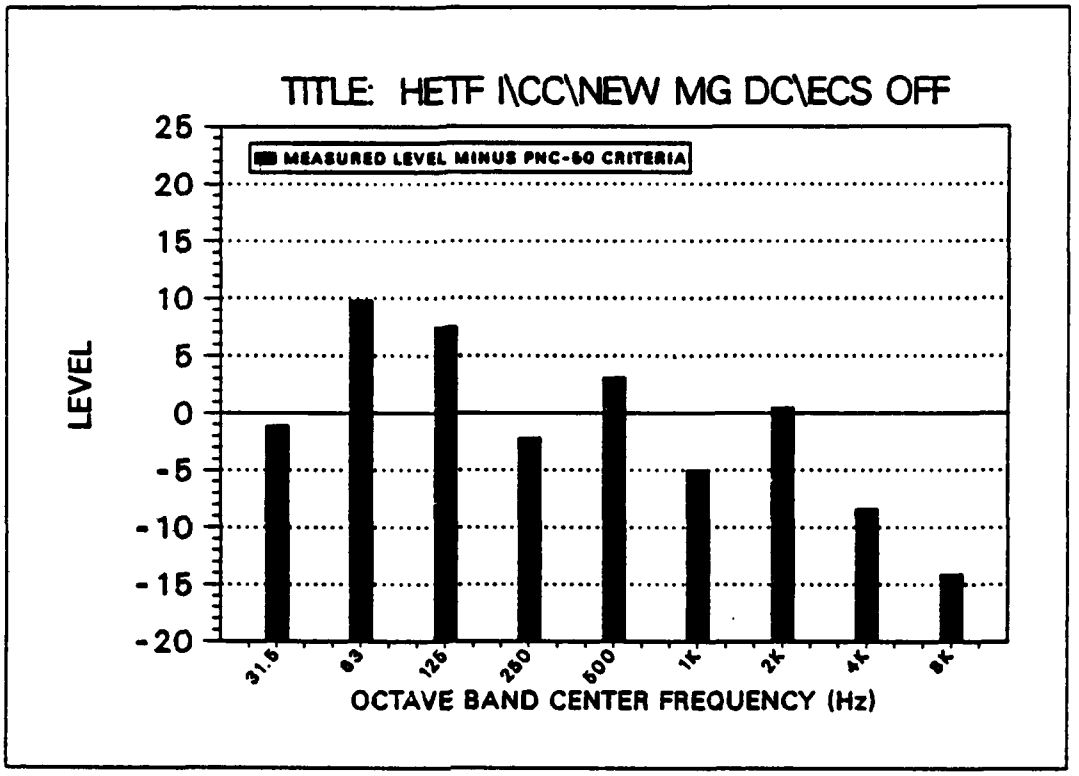
FREQ (Hz)	OCTAVE BAND SPL (dB)	PNC-60 CRITERIA (dB)	MEASURED LEVEL MINUS PNC-60 (dB)
31.5	69.7	70	-0.3
63	63.8	66	-2.2
125	63.3	62	1.3
250	60.9	58	2.9
500	58.1	54	4.1
1,000	55.1	50	5.1
2,000	55	46	9
4,000	54	43	11
8,000	49.3	43	6.3



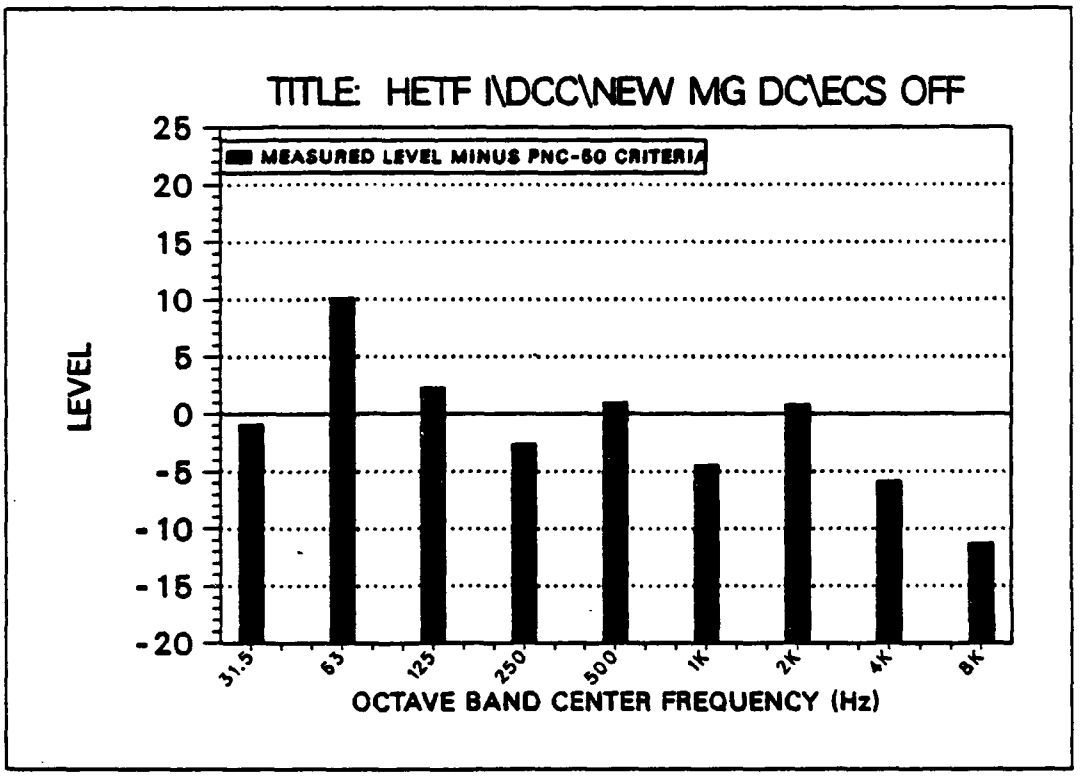
FREQ (Hz)	OCTAVE BAND SPL (dB)	PNC-50 CRITERIA (dB)	MEASURED LEVEL MINUS PNC-50 (dB)
31.5	76.4	70	6.4
63	72	66	6
125		62	7.2
250	70.1	58	12.1
500	67.3	54	13.3
1,000	70.9	50	20.9
2,000	64.1	46	18.1
4,000	53.9	43	10.9
8,000	44.1	43	1.1



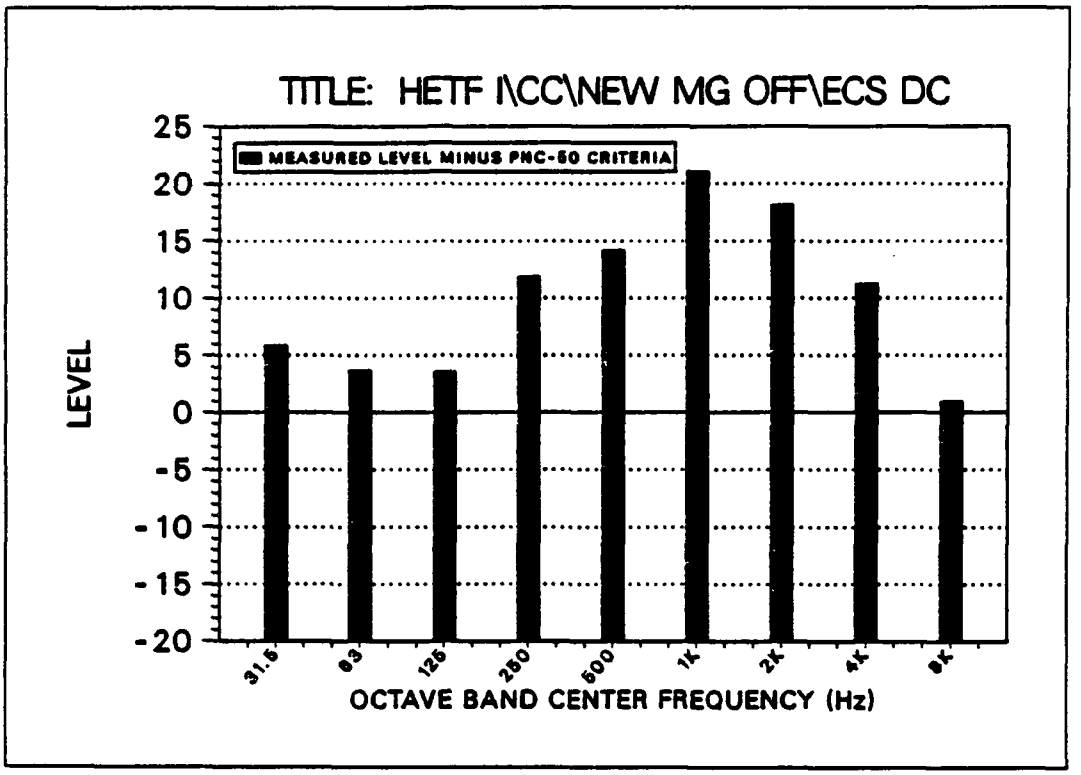
FREQ (Hz)	OCTAVE BAND SPL (dB)	PNC-50 CRITERIA (dB)	MEASURED LEVEL MINUS PNC-50 (dB)
31.5	76.7	70	6.7
63	76.3	66	10.3
125	67.7	62	5.7
250	71.4	58	13.4
500	68.7	54	14.7
1,000	72	50	22
2,000	69.6	46	23.6
4,000	54.2	43	11.2
8,000	46.1	43	3.1



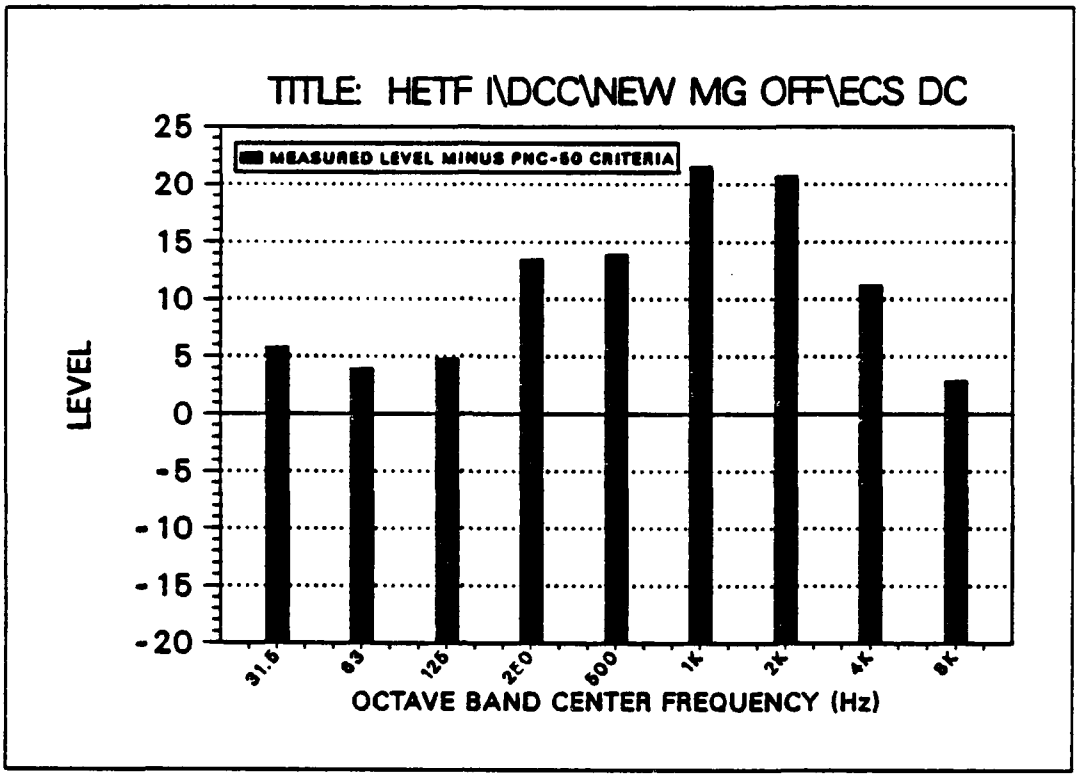
FREQ (Hz)	OCTAVE BAND SPL (dB)	PNC-60 CRITERIA (dB)	MEASURED LEVEL MINUS PNC-60 (dB)
31.5	68.9	70	-1.1
63	75.8	66	9.8
125	69.5	62	7.5
250	55.8	58	-2.2
500	57.1	54	3.1
1,000	45	50	-5
2,000	46.5	46	0.5
4,000	34.6	43	-8.4
8,000	28.9	43	-14.1



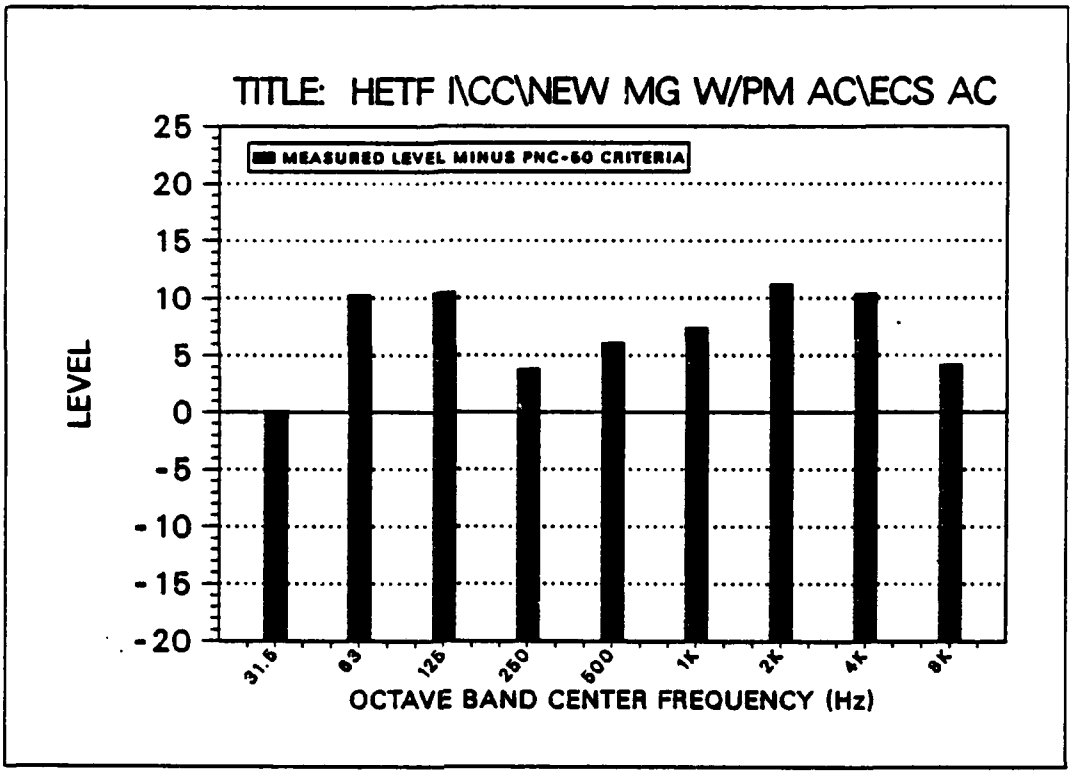
FREQ (Hz)	OCTAVE BAND SPL (dB)	PNC-60 CRITERIA (dB)	MEASURED LEVEL MINUS PNC-60 (dB)
31.5	69.1	70	−0.9
63	76.1	66	10.1
125	64.3	62	2.3
250	55.4	58	−2.6
500	55	54	1
1,000	45.6	50	−4.4
2,000	46.8	46	0.8
4,000	37.2	43	−5.8
8,000	31.7	43	−11.3



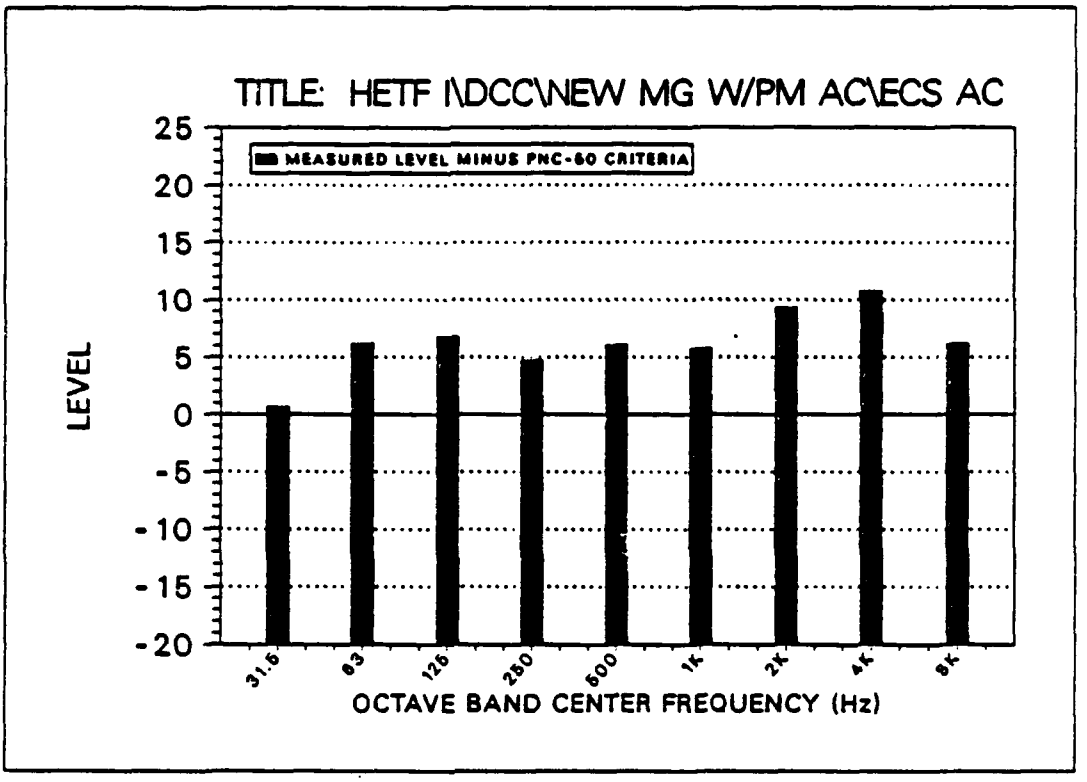
FREQ (Hz)	OCTAVE BAND SPL (dB)	PNC-50 CRITERIA (dB)	MEASURED LEVEL MINUS PNC-50 (dB)
31.5	75.9	70	5.9
63	69.7	66	3.7
125	65.6	62	3.6
250	69.9	58	11.9
500	68.2	54	14.2
1,000	71.1	50	21.1
2,000	64.2	46	18.2
4,000	54.3	43	11.3
8,000	44	43	1



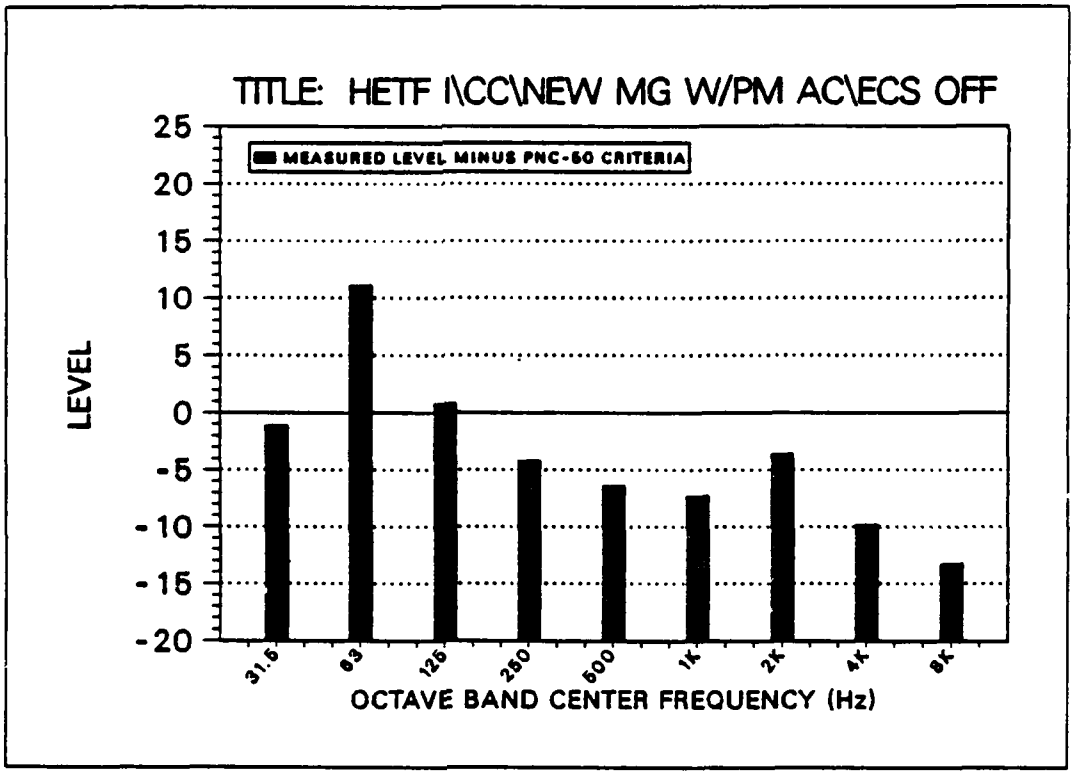
FREQ (Hz)	OCTAVE BAND SPL (dB)	PNC-50 CRITERIA (dB)	MEASURED LEVEL MINUS PNC-50 (dB)
31.5	75.8	70	5.8
63	69.9	66	3.9
125	66.8	62	4.8
250	71.5	58	13.5
500	67.9	54	13.9
1,000	71.6	50	21.6
2,000	66.7	46	20.7
4,000	54.2	43	11.2
8,000	45.9	43	2.9



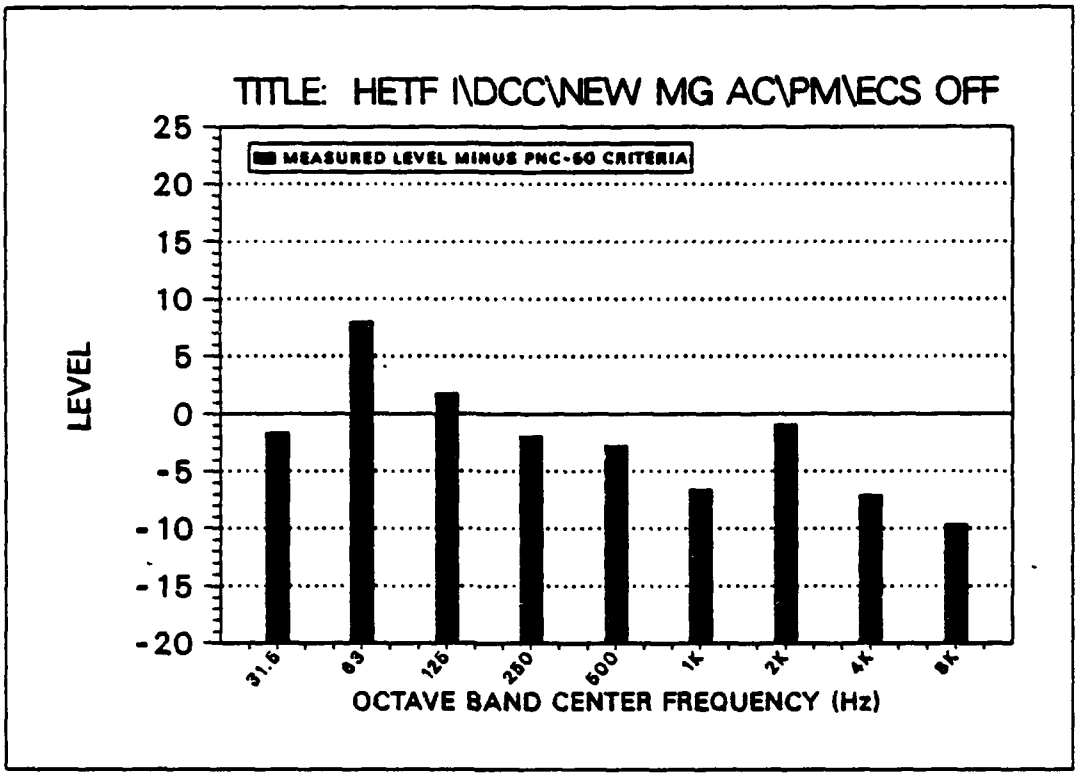
FREQ (Hz)	OCTAVE BAND SPL (dB)	PNC-60 CRITERIA (dB)	MEASURED LEVEL MINUS PNC-60 (dB)
31.5	70.1	70	0.1
63	76.3	66	10.3
125	72.5	62	10.5
250	61.8	58	3.8
500	60.1	54	6.1
1,000	57.4	50	7.4
2,000	57.2	46	11.2
4,000	53.4	43	10.4
8,000	47.2	43	4.2



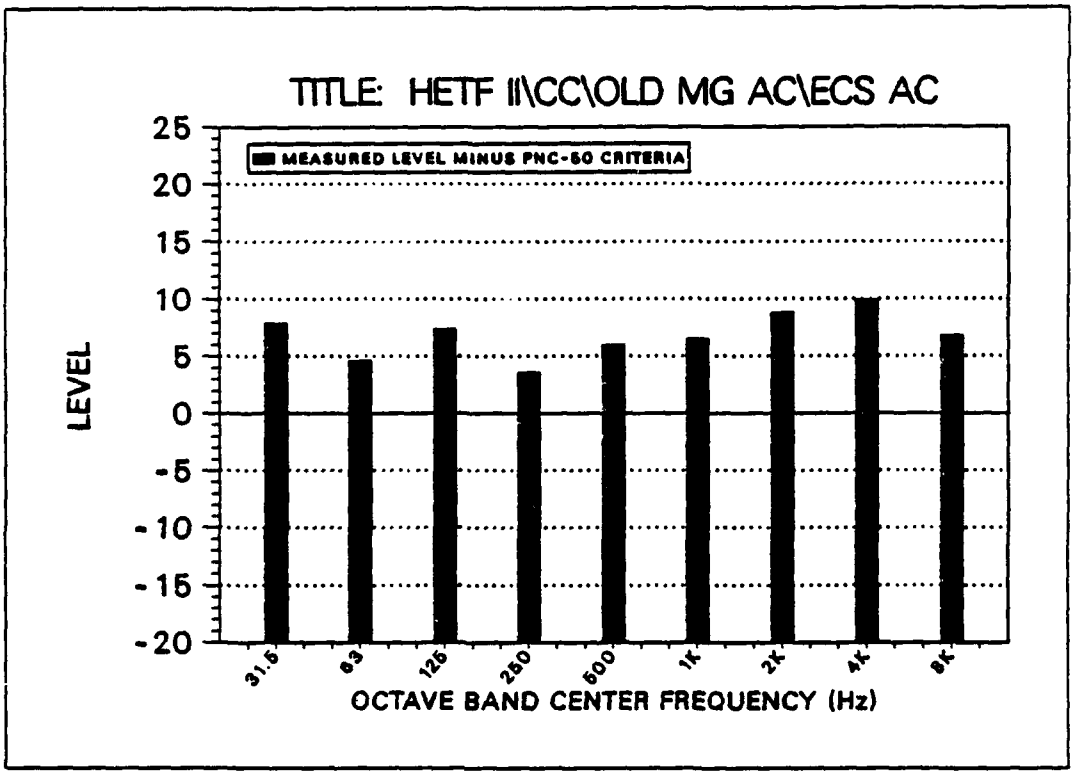
FREQ (Hz)	OCTAVE BAND SPL (dB)	PNC-60 CRITERIA (dB)	MEASURED LEVEL MINUS PNC-60 (dB)
31.5	70.7	70	0.7
63	72.2	66	6.2
125	68.8	62	6.8
250	62.7	58	4.7
500	60.1	54	6.1
1,000	55.8	50	5.8
2,000	55.3	46	9.3
4,000	53.8	43	10.8
8,000	49.2	43	6.2



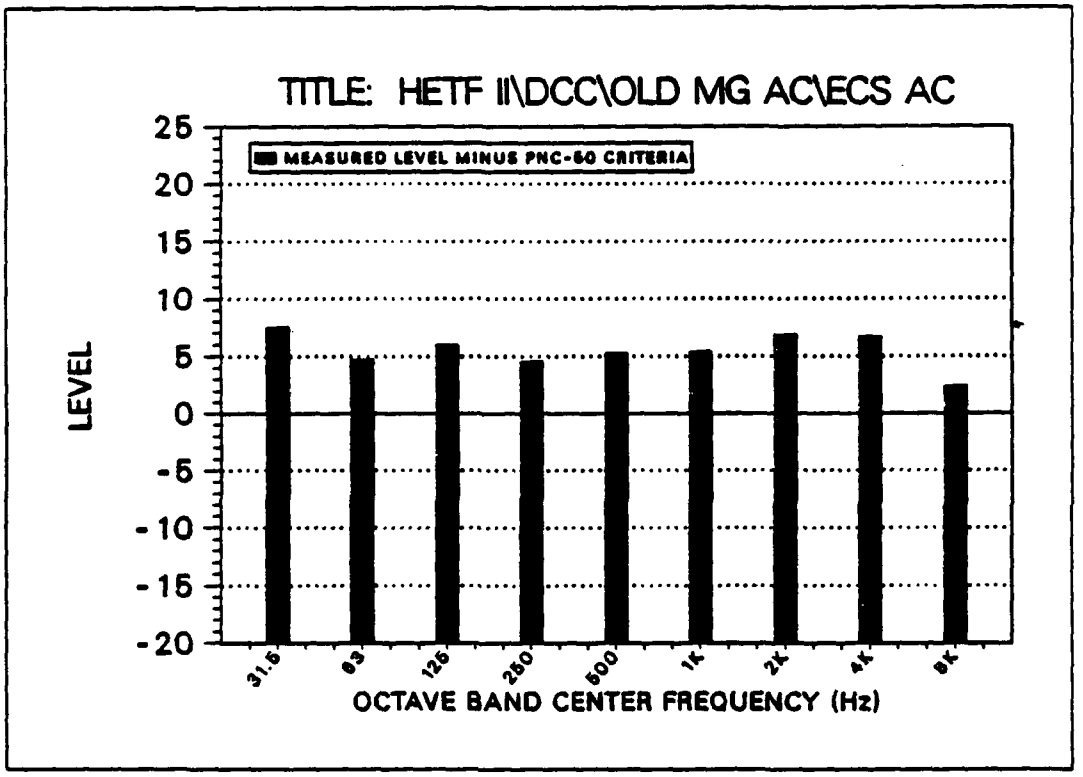
FREQ (Hz)	OCTAVE BAND SPL (dB)	PNC-60 CRITERIA (dB)	MEASURED LEVEL MINUS PNC-60 (dB)
31.5	68.9	70	−1.1
63	77.1	66	11.1
125	62.8	62	0.8
250	53.8	58	−4.2
500	47.6	54	−6.4
1,000	42.7	50	− −7.3
2,000	42.4	46	−3.6
4,000	33.2	43	−9.8
8,000	29.7	43	−13.3



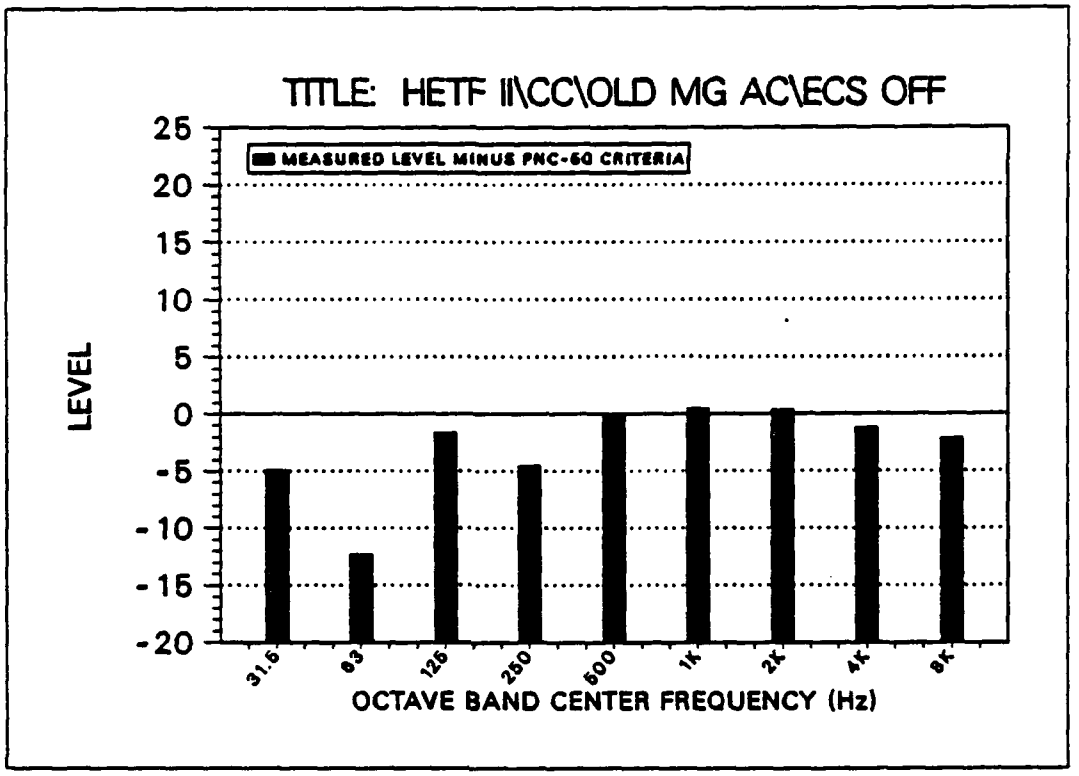
FREQ (Hz)	OCTAVE BAND SPL (dB)	PNC-50 CRITERIA (dB)	MEASURED LEVEL MINUS PNC-50 (dB)
31.5	68.4	70	−1.6
63	74	66	8
125	63.8	62	1.8
250	56.1	58	−1.9
500	51.2	54	−2.8
1,000	43.4	50	−6.6
2,000	45.1	46	−0.9
4,000	35.9	43	−7.1
8,000	33.4	43	−9.6



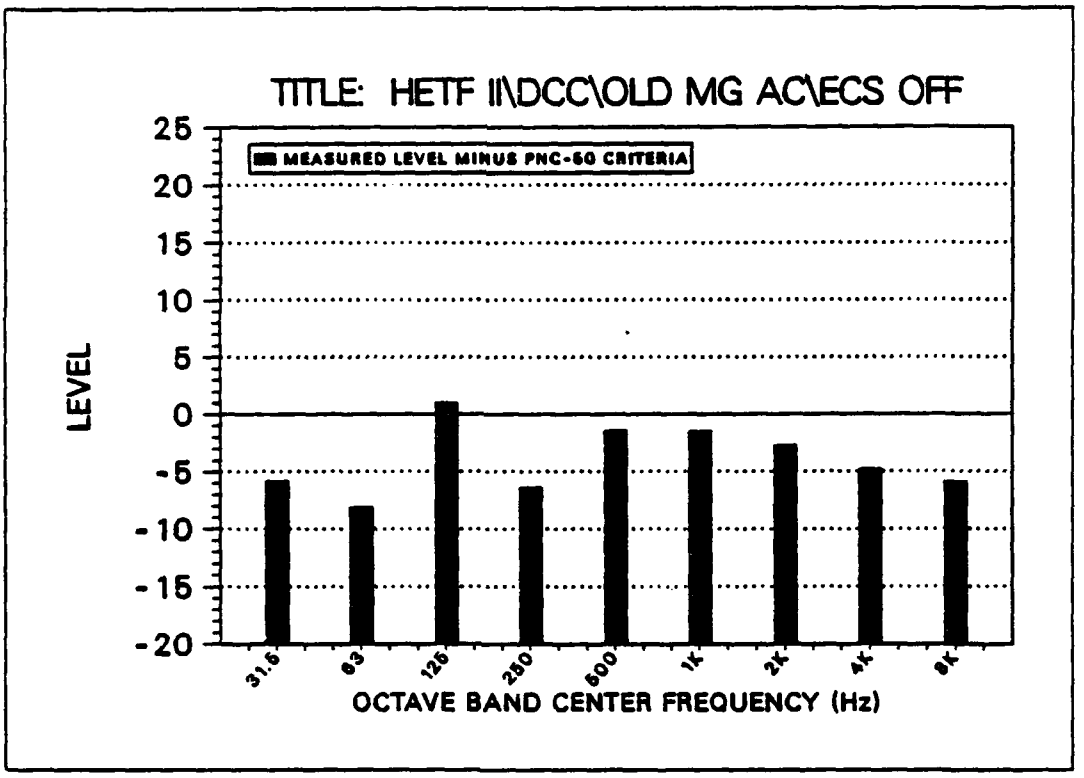
FREQ (Hz)	OCTAVE BAND SPL (dB)	PNC-60 CRITERIA (dB)	MEASURED LEVEL MINUS PNC-60 (dB)
31.5	77.9	70	7.9
63	70.6	66	4.6
125	69.4	62	7.4
250	61.6	58	3.6
500	60	54	6
1,000	56.5	50	6.5
2,000	54.8	46	8.8
4,000	52.9	43	9.9
8,000	49.8	43	6.8



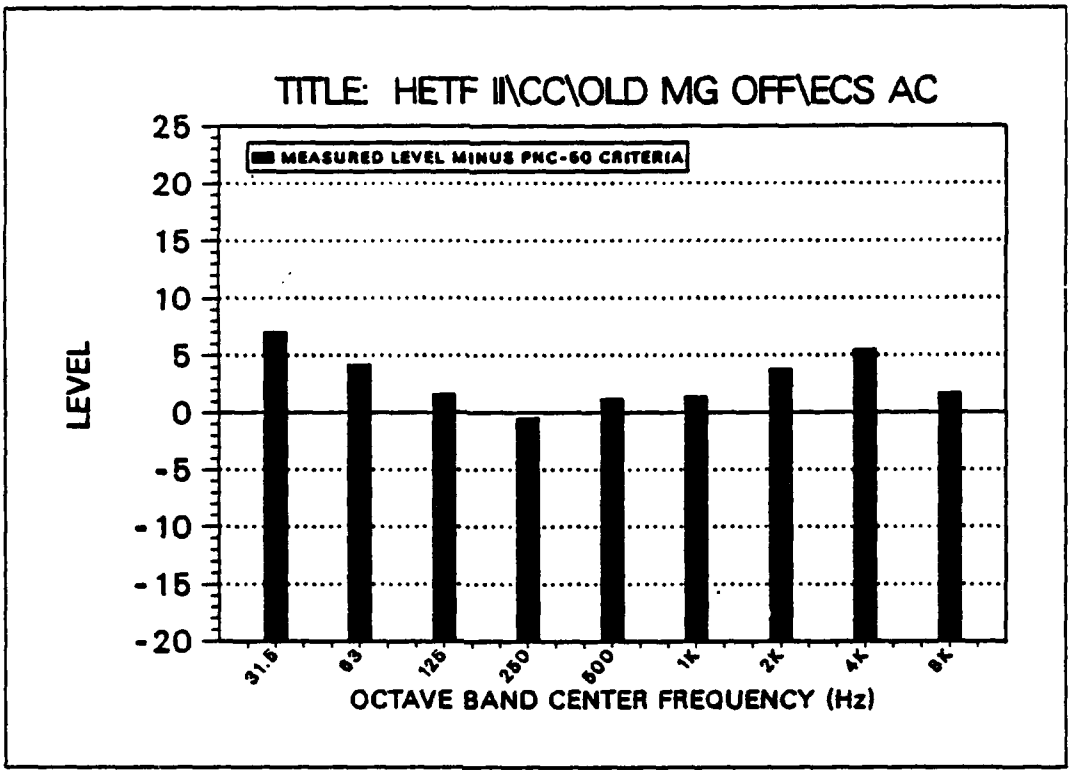
FREQ (Hz)	OCTAVE BAND SPL (dB)	PNC-50 CRITERIA (dB)	MEASURED LEVEL MINUS PNC-50 (dB)
31.5	77.5	70	7.5
63	70.7	66	4.7
125	68	62	6
250	62.6	58	4.6
500	59.3	54	5.3
1,000	55.4	50	5.4
2,000	52.9	46	6.9
4,000	49.7	43	6.7
8,000	45.4	43	2.4



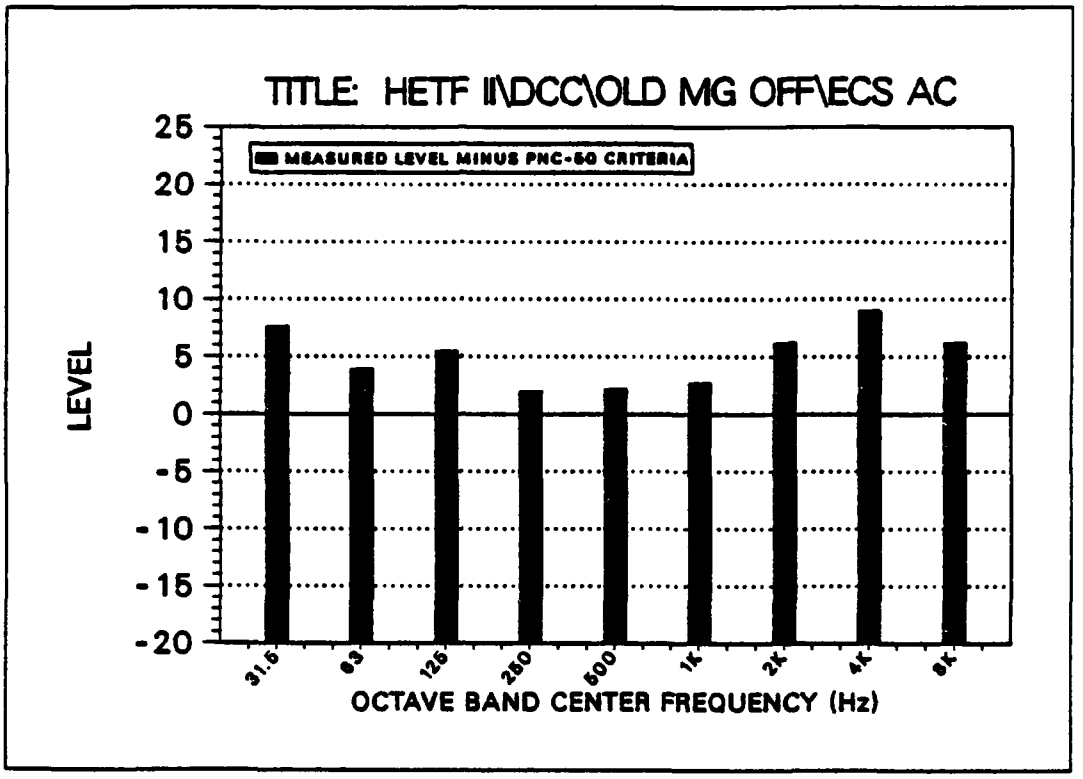
FREQ (Hz)	OCTAVE BAND SPL (dB)	PNC-60 CRITERIA (dB)	MEASURED LEVEL MINUS PNC-60 (dB)
31.5	65.1	70	−4.9
63	53.7	66	−12.3
125	60.4	62	−1.6
250	53.5	58	−4.5
500	53.8	54	−0.2
1,000	50.5	50	0.5
2,000	46.4	46	0.4
4,000	41.8	43	−1.2
8,000	40.9	43	−2.1



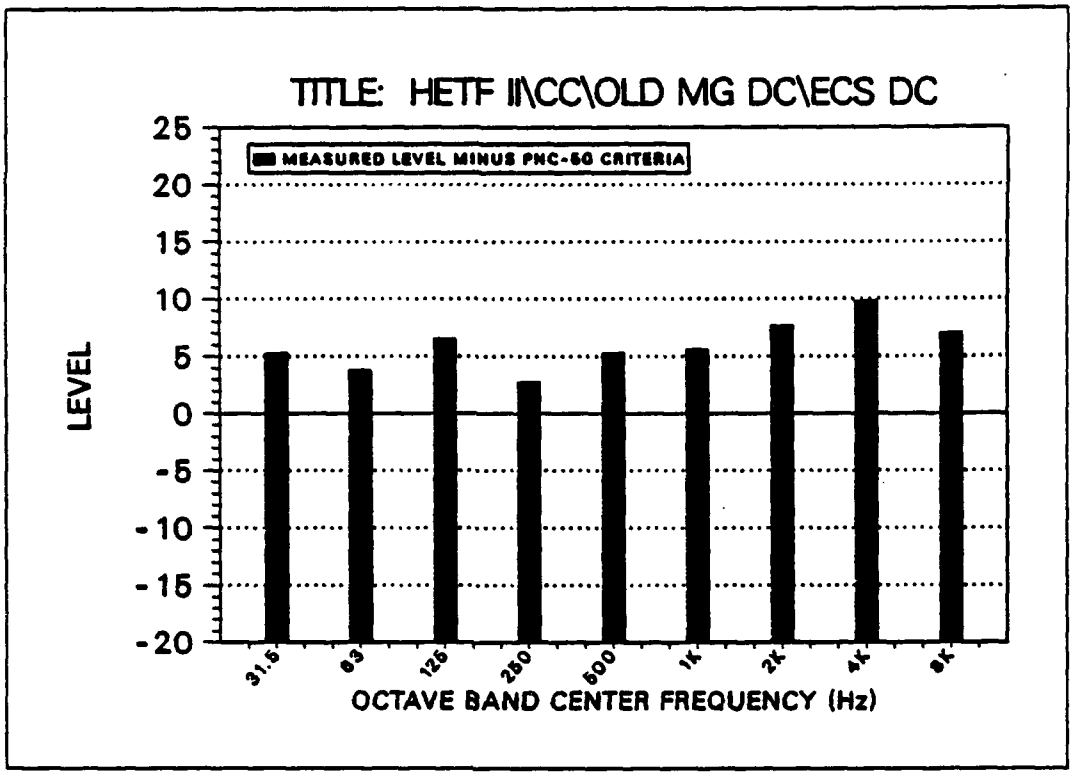
FREQ (Hz)	OCTAVE BAND SPL (dB)	PNC-60 CRITERIA (dB)	MEASURED LEVEL MINUS PNC-60 (dB)
31.5	64.2	70	-5.8
63	57.9	66	-8.1
125	63	62	1
250	51.6	58	-6.4
500	52.6	54	-1.4
1,000	48.5	50	-1.5
2,000	43.3	46	-2.7
4,000	38.2	43	-4.8
8,000	37.1	43	-5.9



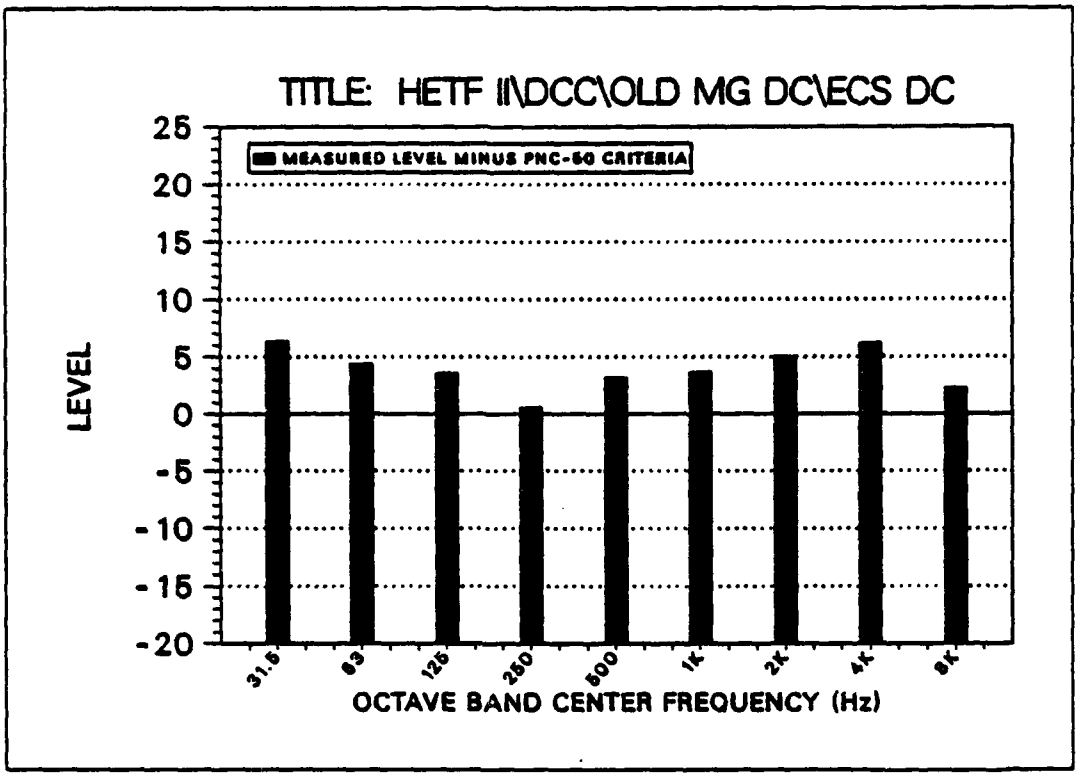
FREQ (Hz)	OCTAVE BAND SPL (dB)	PNC-60 CRITERIA (dB)	MEASURED LEVEL MINUS PNC-60 (dB)
31.5	77	70	7
63	70.2	66	4.2
125	63.6	62	1.6
250	57.5	58	−0.5
500	55.2	54	1.2
1,000	51.4	50	1.4
2,000	49.8	46	3.8
4,000	48.5	43	5.5
8,000	44.7	43	1.7



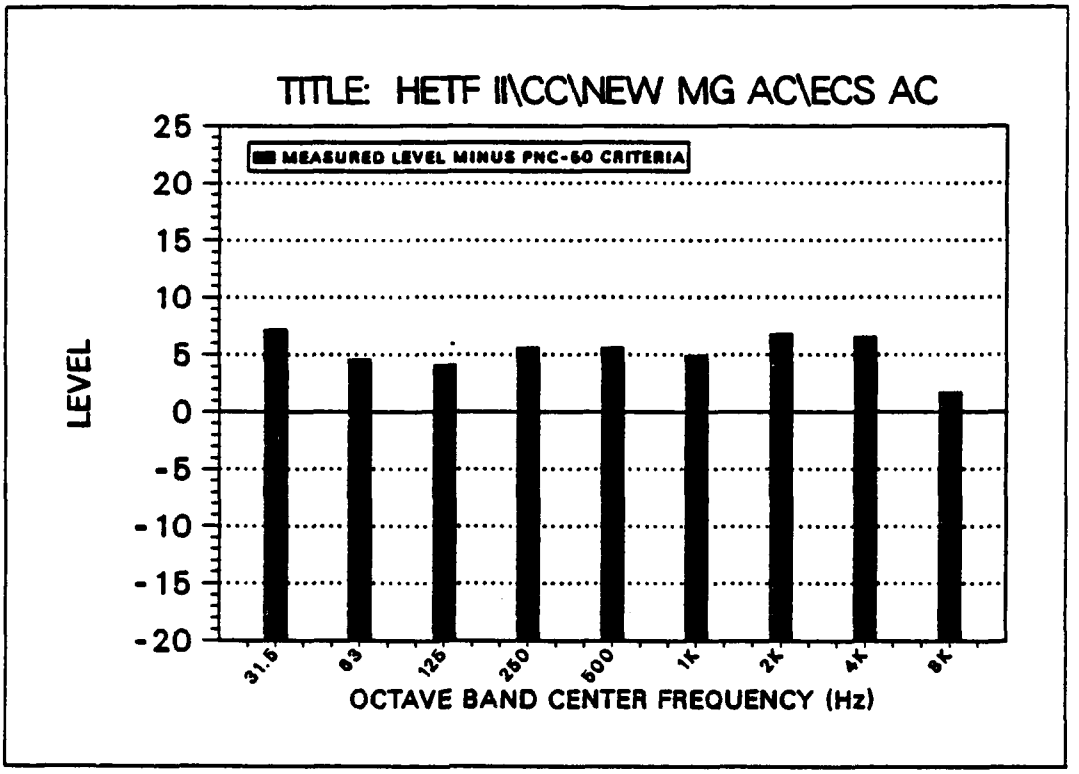
FREQ (Hz)	OCTAVE BAND SPL (dB)	PNC-50 CRITERIA (dB)	MEASURED LEVEL MINUS PNC-50 (dB)
31.5	77.6	70	7.6
63	69.9	66	3.9
125	67.5	62	5.5
250	60	58	2
500	56.2	54	2.2
1,000	52.7	50	2.7
2,000	52.2	46	6.2
4,000	52	43	9
8,000	49.2	43	6.2



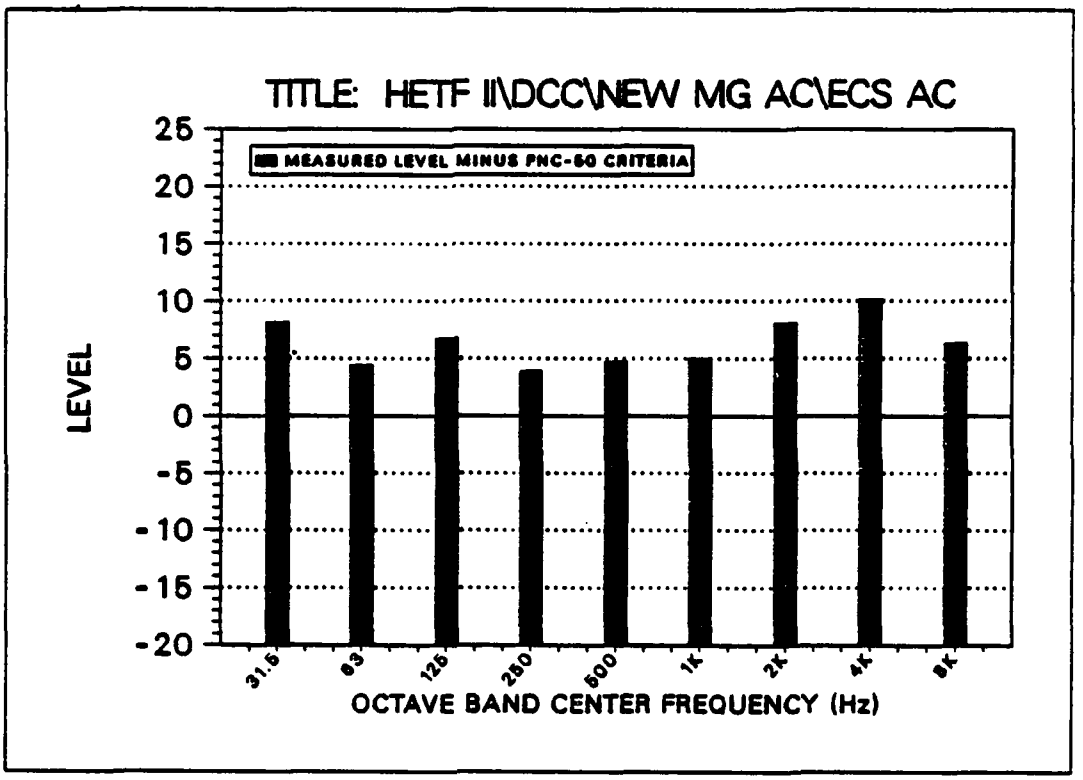
FREQ (Hz)	OCTAVE BAND SPL (dB)	PNC-60 CRITERIA (dB)	MEASURED LEVEL MINUS PNC-60 (dB)
31.5	75.3	70	5.3
63	69.8	66	3.8
125	68.5	62	6.5
250	60.8	58	2.8
500	59.3	54	5.3
1,000	55.6	50	5.6
2,000	53.7	46	7.7
4,000	52.8	43	9.8
8,000	50	43	7



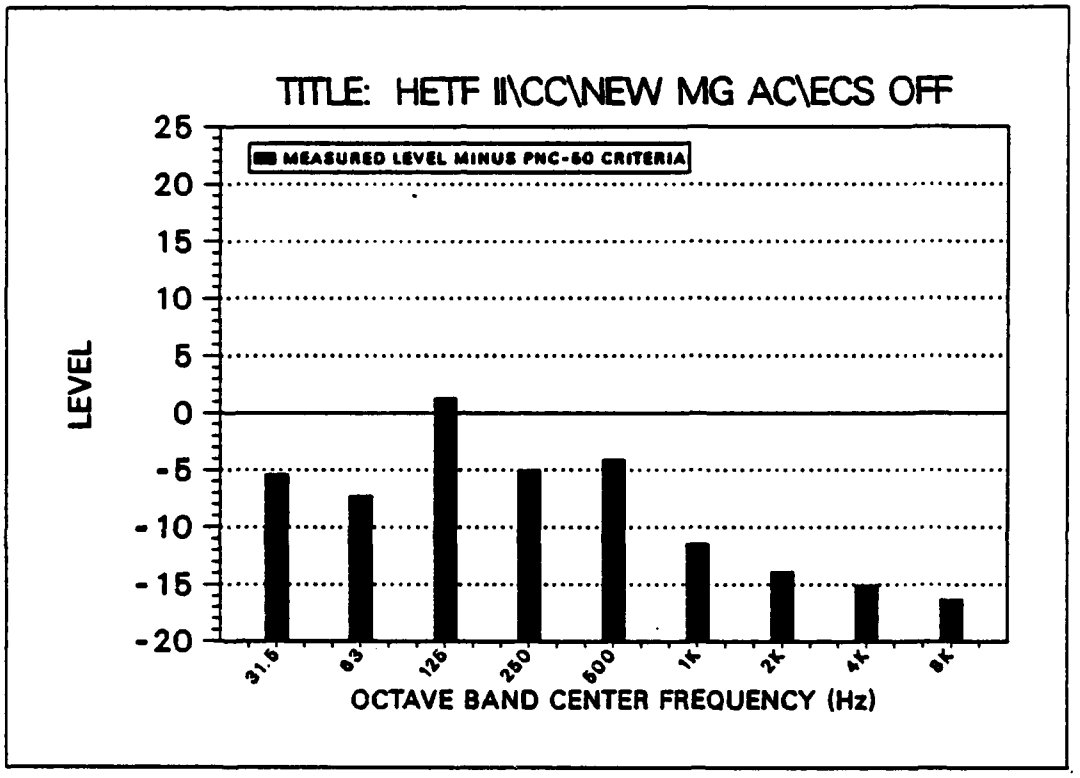
FREQ (Hz)	OCTAVE BAND SPL (dB)	PNC-60 CRITERIA (dB)	MEASURED LEVEL MINUS PNC-60 (dB)
31.5	76.4	70	6.4
63	70.4	66	4.4
125	65.6	62	3.6
250	58.6	58	0.6
500	57.2	54	3.2
1,000	53.7	50	3.7
2,000	51.1	46	5.1
4,000	49.2	43	6.2
8,000	45.3	43	2.3



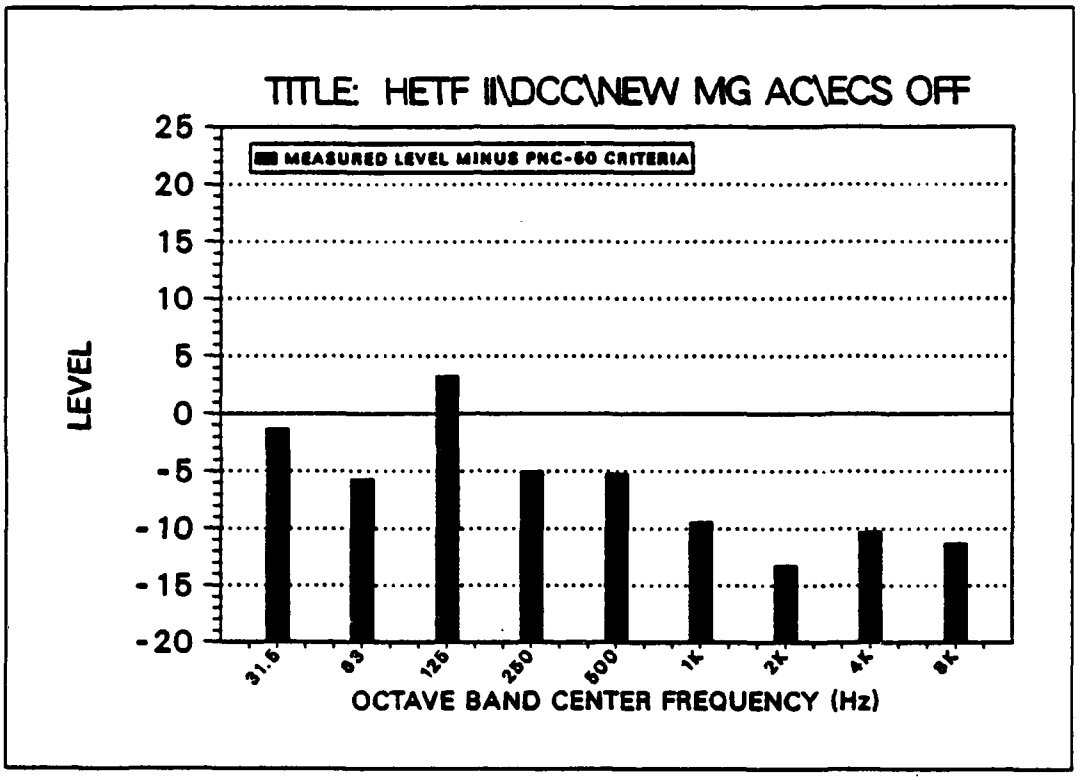
FREQ (Hz)	OCTAVE BAND SPL (dB)	PNC-60 CRITERIA (dB)	MEASURED LEVEL MINUS PNC-60 (dB)
31.5	77.2	70	7.2
63	70.6	66	4.6
125	66.1	62	4.1
250	63.6	58	5.6
500	59.6	54	5.6
1,000	54.9	50	4.9
2,000	52.8	46	6.8
4,000	49.5	43	6.5
8,000	44.7	43	1.7



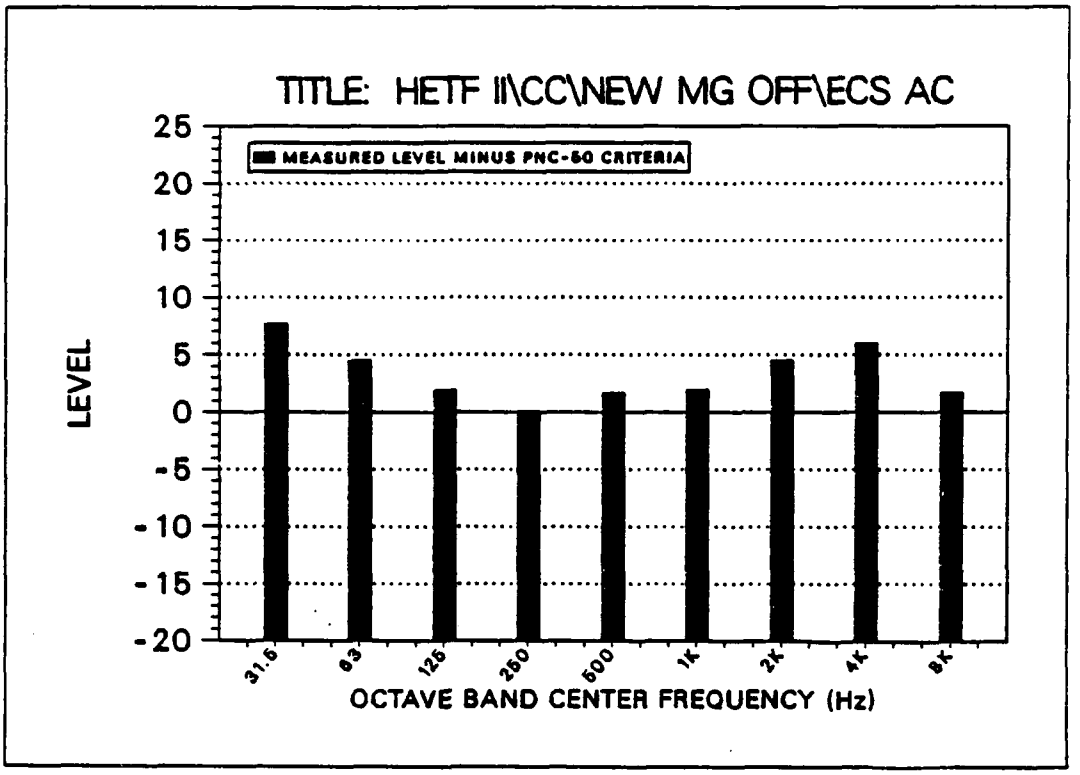
FREQ (Hz)	OCTAVE BAND SPL (dB)	PNC-60 CRITERIA (dB)	MEASURED LEVEL MINUS PNC-60 (dB)
31.5	78.2	70	8.2
63	70.4	66	4.4
125	68.8	62	6.8
250	61.9	58	3.9
500	58.7	54	4.7
1,000	55	50	5
2,000	54.1	46	8.1
4,000	53.1	43	10.1
8,000	49.4	43	6.4



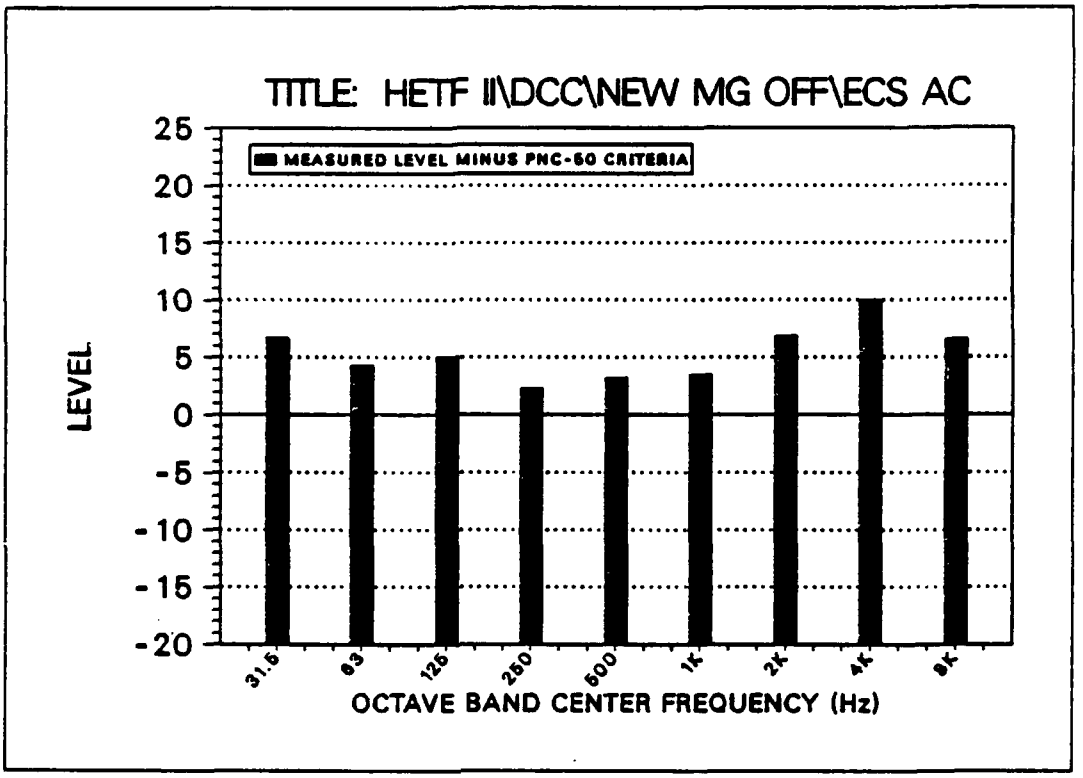
FREQ (Hz)	OCTAVE BAND SPL (dB)	PNC-50 CRITERIA (dB)	MEASURED LEVEL MINUS PNC-50 (dB)
31.5	64.6	70	-5.4
63	58.7	66	-7.3
125	63.3	62	1.3
250	53	58	-5
500	49.9	54	-4.1
1,000	38.6	50	-11.4
2,000	32.1	46	-13.9
4,000	27.9	43	-15.1
8,000	26.7	43	-16.3



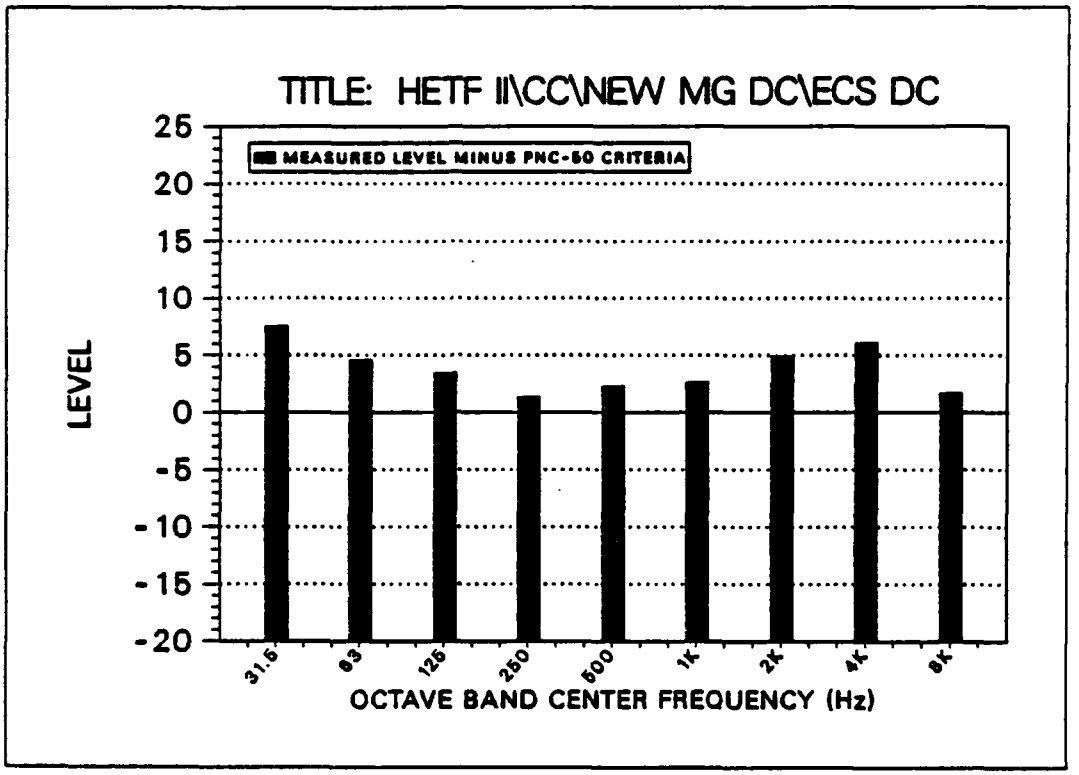
FREQ (Hz)	OCTAVE BAND SPL (dB)	PNC-60 CRITERIA (dB)	MEASURED LEVEL MINUS PNC-60 (dB)
31.5	68.7	70	-1.3
63	60.3	66	-5.7
125	65.3	62	3.3
250	53	58	-5
500	48.8	54	-5.2
1,000	40.6	50	-9.4
2,000	32.8	46	-13.2
4,000	32.7	43	-10.3
8,000	31.7	43	-11.3



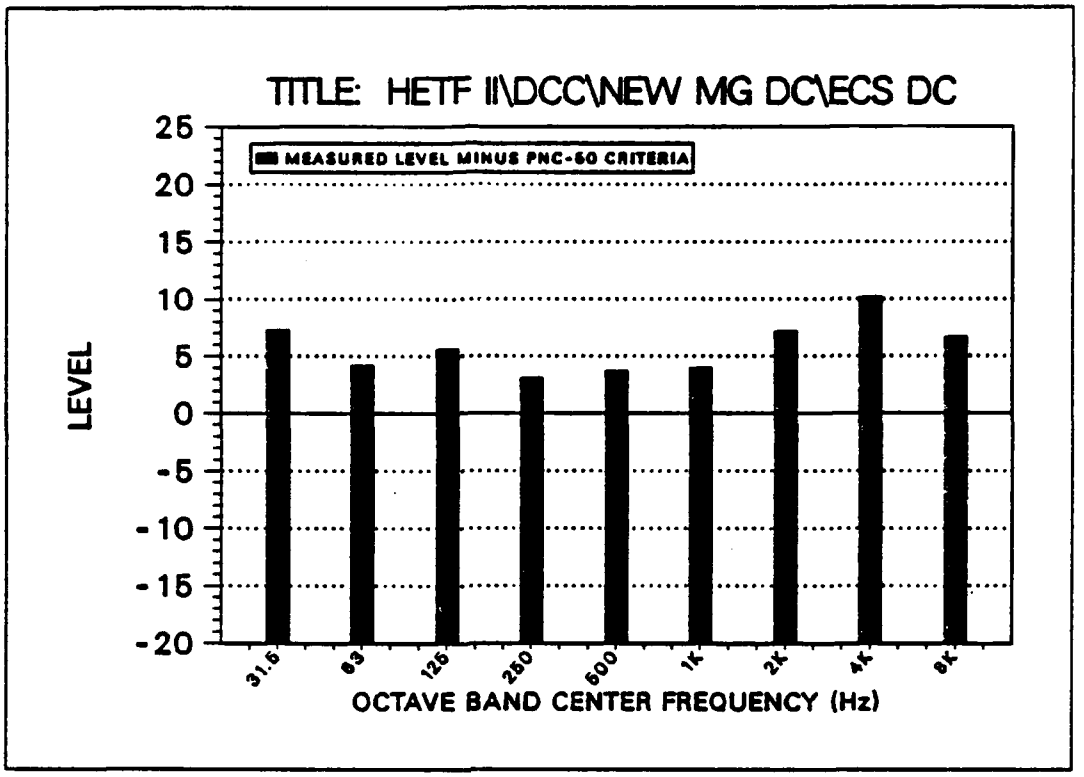
FREQ (Hz)	OCTAVE BAND SPL (dB)	PNC-50 CRITERIA (dB)	MEASURED LEVEL MINUS PNC-50 (dB)
31.5	77.7	70	7.7
63	70.5	66	4.5
125	63.9	62	1.9
250	58.1	58	0.1
500	55.7	54	1.7
1,000	52	50	2
2,000	50.5	46	4.5
4,000	49	43	6
8,000	44.7	43	1.7



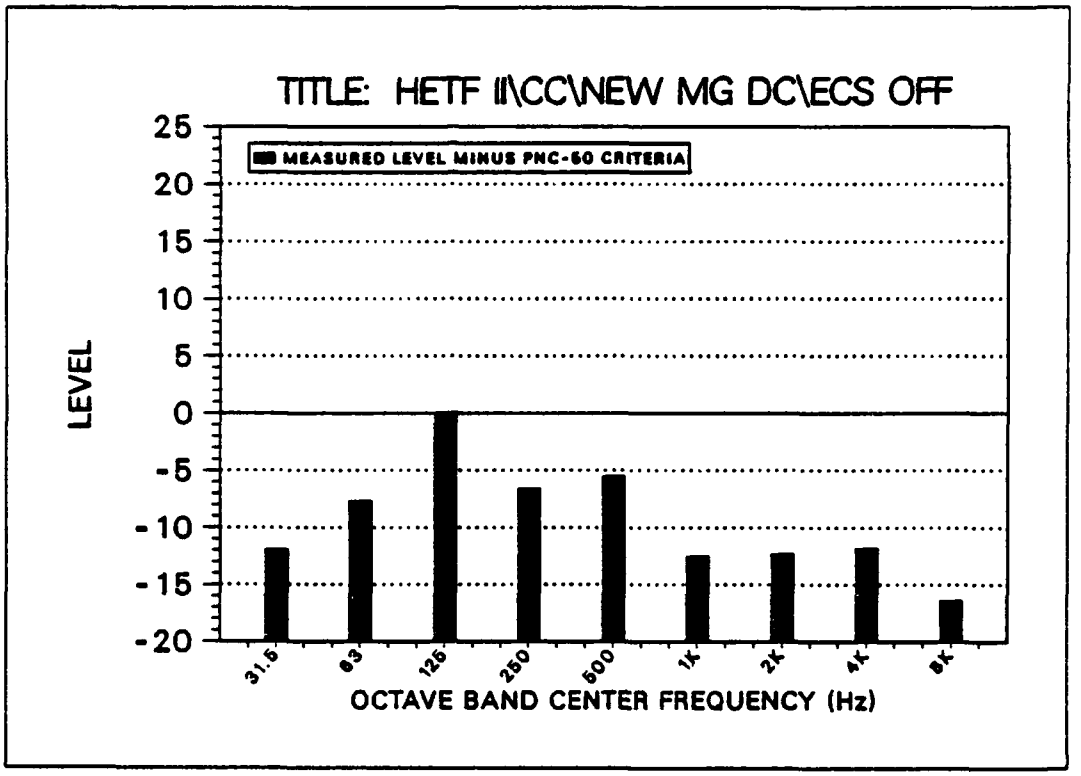
FREQ (Hz)	OCTAVE BAND SPL (dB)	PNC-60 CRITERIA (dB)	MEASURED LEVEL MINUS PNC-60 (dB)
31.5	76.7	70	6.7
63	70.3	66	4.3
125	67.1	62	5.1
250	60.3	58	2.3
500	57.2	54	3.2
1,000	53.5	50	3.5
2,000	52.9	46	6.9
4,000	53	43	10
8,000	49.6	43	6.6



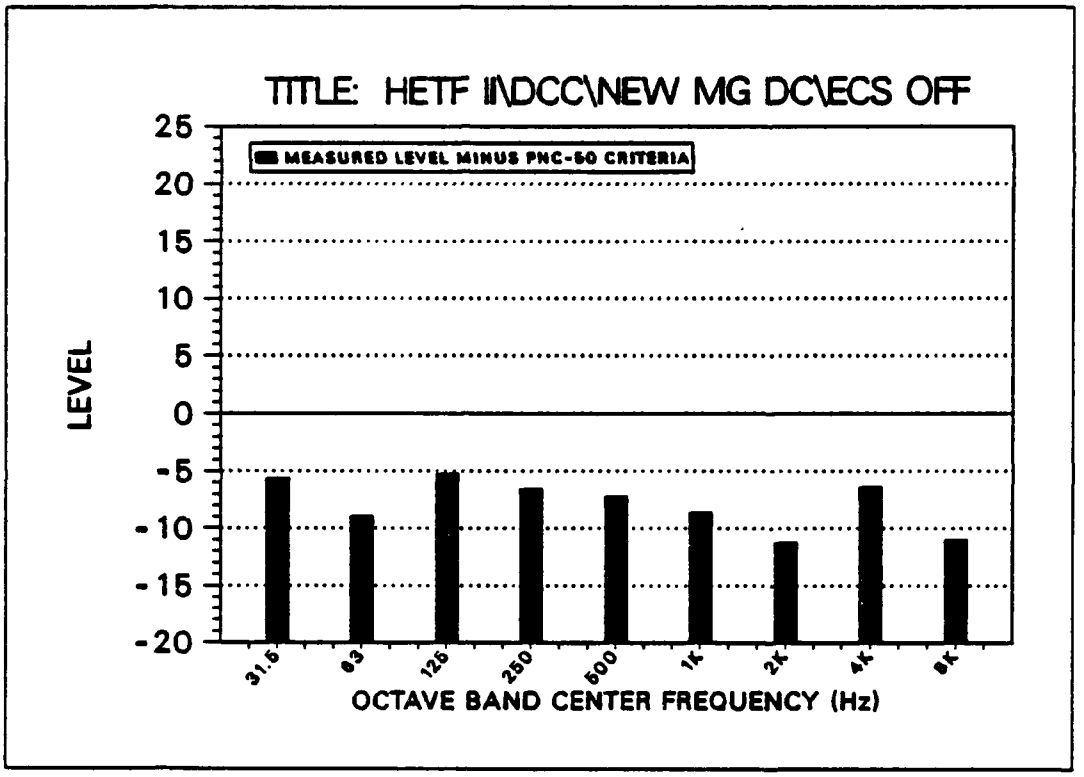
FREQ (Hz)	OCTAVE BAND SPL (dB)	PNC-50 CRITERIA (dB)	MEASURED LEVEL MINUS PNC-50 (dB)
31.5	77.5	70	7.5
63	70.6	66	4.6
125	65.4	62	3.4
250	59.3	58	1.3
500	56.3	54	2.3
1,000	52.6	50	2.6
2,000	50.9	46	4.9
4,000	49.1	43	6.1
8,000	44.7	43	1.7



FREQ (Hz)	OCTAVE BAND SPL (dB)	PNC-60 CRITERIA (dB)	MEASURED LEVEL MINUS PNC-60 (dB)
31.5	77.3	70	7.3
63	70.2	66	4.2
125	67.6	62	5.6
250	61.1	58	3.1
500	57.7	54	3.7
1,000	54	50	4
2,000	53.2	46	7.2
4,000	53.2	43	10.2
8,000	49.7	43	6.7



FREQ (Hz)	OCTAVE BAND SPL (dB)	PNC-50 CRITERIA (dB)	MEASURED LEVEL MINUS PNC-60 (dB)
31.5	58.1	70	−11.9
63	58.3	66	−7.7
125	62.1	62	0.1
250	51.4	58	−6.6
500	48.5	54	−5.5
1,000	37.5	50	−12.5
2,000	33.7	46	−12.3
4,000	31.2	43	-11.8
8,000	26.6	43	−16.4



FREQ (Hz)	OCTAVE BAND SPL (dB)	PNC-60 CRITERIA (dB)	MEASURED LEVEL MINUS PNC-60 (dB)
31.5	64.4	70	-5.6
63	57.1	66	-8.9
125	56.8	62	-5.2
250	51.5	58	-6.5
500	46.8	54	-7.2
1,000	41.4	50	-8.6
2,000	34.8	46	-11.2
4,000	36.6	43	-6.4
8,000	32	43	-11

APPENDIX B

1/3 Octave Band Measurements at the LCC Crew Positions

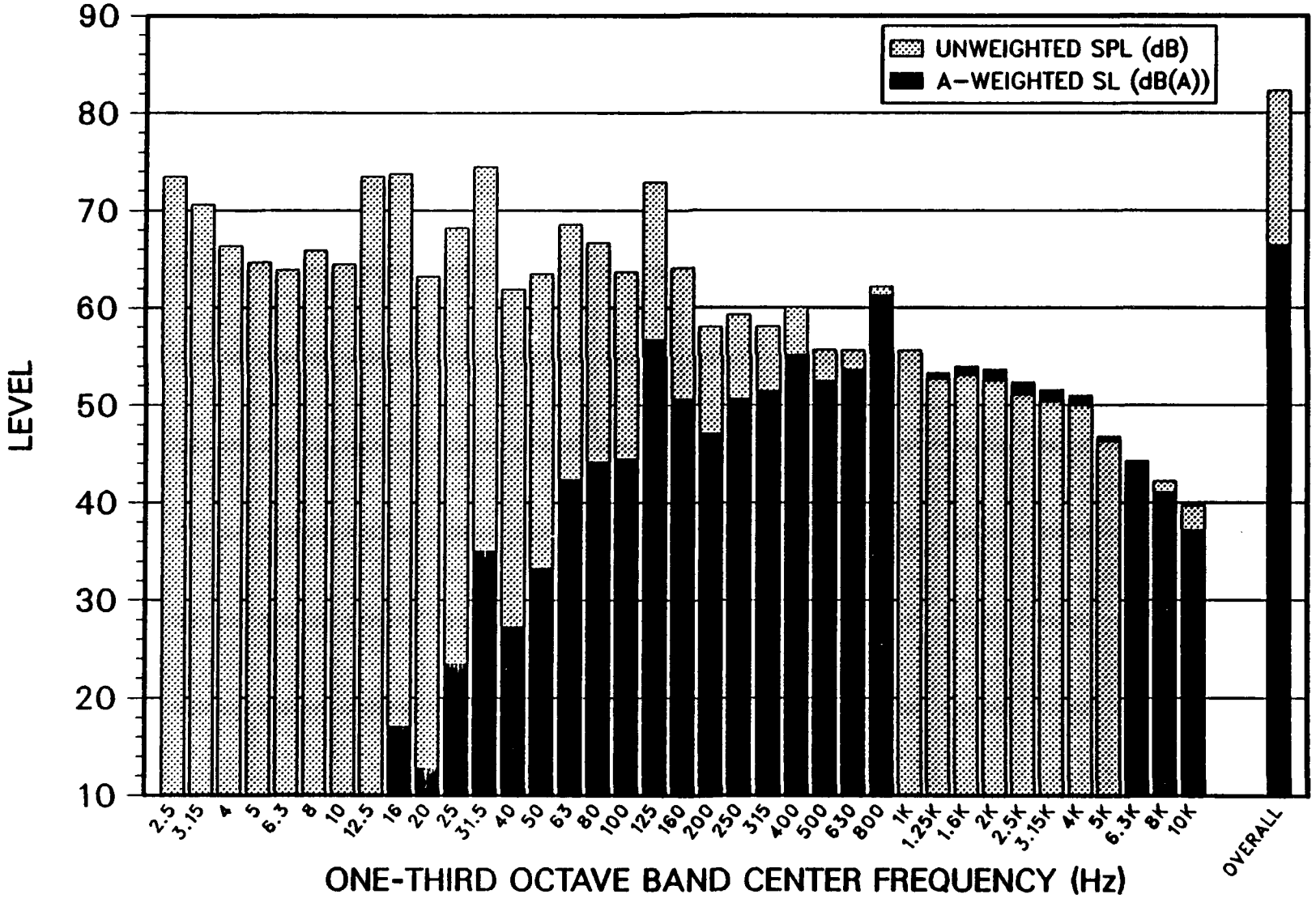
TITLE: HETF I\CC\OLD MG AC\ECS AC

FREQ (Hz)	SOUND PRESSURE LEVEL (dB)	OCTAVE BAND SPL (dB)	A-WEIGHTED SOUND LEVEL [dB(A)]	A-WEIGHTED OCTAVE BAND SL [dB(A)]
2.5	73.5		0	
3.15	70.6		0	
4	66.4	72.6	0	0
5	64.7		0	
6.3	63.9		0	
8	65.9	69.4	0	0
10	64.5		0	
12.5	73.5		10.1	
16	73.8	76.6	17.1	18.8
20	63.2		12.7	
25	68.2		23.5	
31.5	74.5	75.4	35.1	35.8
40	61.9		27.3	
50	63.5		33.3	
63	68.6	71.3	42.4	46.4
80	66.7		44.2	
100	63.7		44.5	
125	72.9	73.6	56.8	57.7
160	64.1		50.7	
200	58		47.1	
250	59.3	63.1	50.7	54.7
315	58.1		51.5	
400	60.1		55.2	
500	55.7	62.2	52.5	58.5
630	55.6		53.7	
800	62.2		61.3	
1,000	55.6	63.2	55.6	62.7
1,250	52.7		53.3	
1,600	53.1		54	
2,000	52.5	56.9	53.7	58
2,500	51.1		52.4	
3,150	50.4		51.6	
4,000	50	53.9	51	54.9
5,000	46.3		46.8	
6,300	44.3		44.2	
8,000	42.2	47.1	41.1	46.3
10,000	39.7		37.2	

••• OVERALL LEVELS (2.5 - 10,000 Hz) •••

OASPL = 82.3 dB OASLA = 66.5 dB(A)

TITLE: HETF I\CC\OLD MG AC\ECS AC

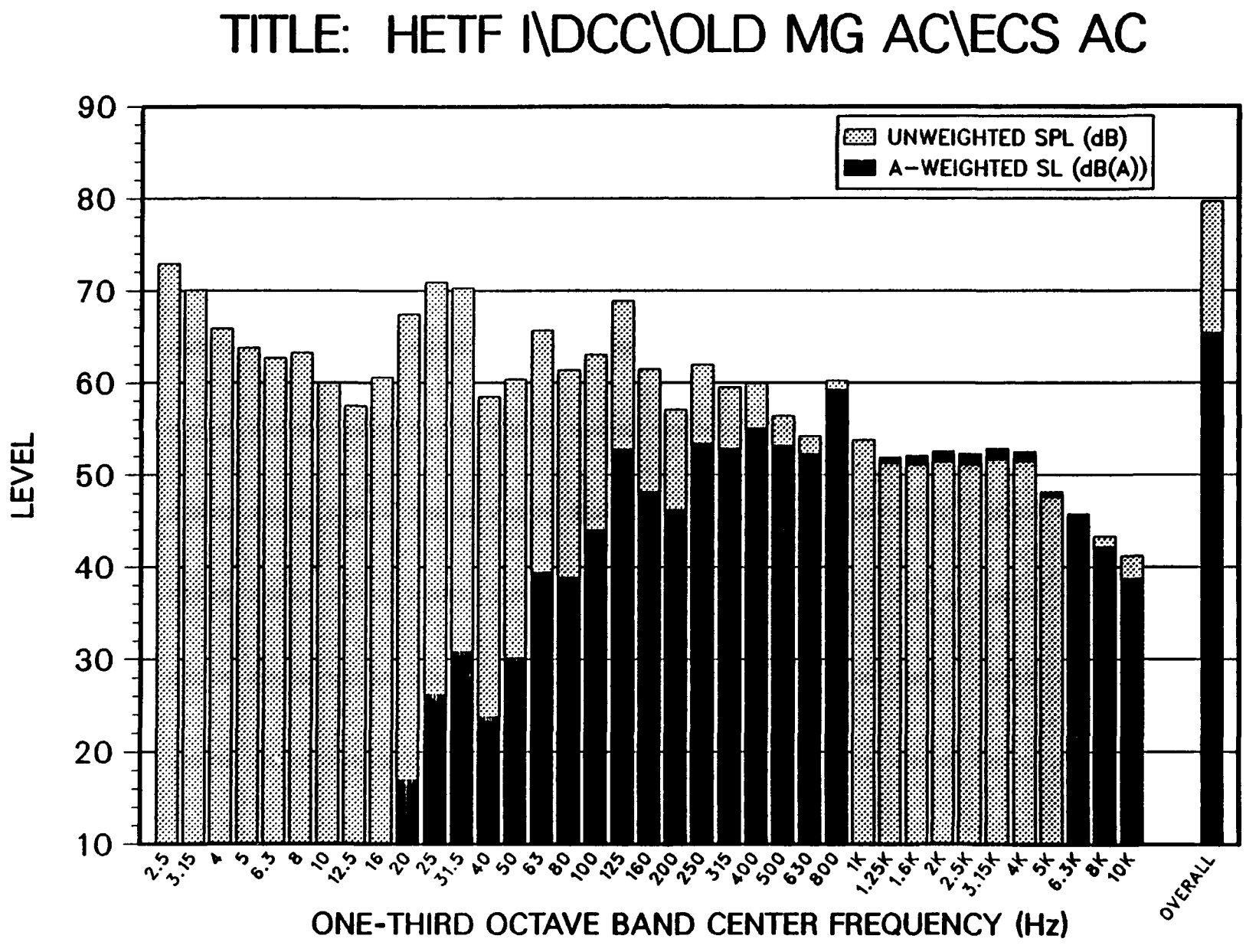


TITLE: HETF I\DCC\OLD MG AC\ECS AC

FREQ (Hz)	SOUND PRESSURE LEVEL (dB)	OCTAVE BAND SPL (dB)	A-WEIGHTED SOUND LEVEL [dB(A)]	A-WEIGHTED OCTAVE BAND SL [dB(A)]
2.5	73		0	
3.15	70.1		0	
4	65.9	72	0	0
5	63.8		0	
6.3	62.7		0	
8	63.3	66.8	0	0
10	60		0	
12.5	57.5		0	
16	60.6	68.4	3.9	17.1
20	67.5		17	
25	70.9		26.2	
31.5	70.3	73.6	30.9	32.6
40	58.5		23.8	
50	60.4		30.2	
63	65.7	67.7	39.5	42.3
80	61.4		38.9	
100	63.1		44	
125	68.9	70.3	52.8	54.3
160	61.5		48.2	
200	57.1		46.2	
250	62	64.6	53.4	56.4
315	59.5		52.9	
400	59.9		55.1	
500	56.4	62.1	53.2	58.3
630	54.2		52.3	
800	60.2		59.3	
1,000	53.8	61.3	53.8	60.8
1,250	51.3		51.9	
1,600	51.1		52.1	
2,000	51.4	55.8	52.6	56.9
2,500	51.1		52.3	
3,150	51.7		52.9	
4,000	51.5	55.2	52.5	56.2
5,000	47.6		48.2	
6,300	45.8		45.6	
8,000	43.3	48.4	42.2	47.6
10,000	41.2		38.8	

*** OVERALL LEVELS (2.5 - 10,000 Hz) ***

OASPL = 79.7 dB OASLA = 65.5 dB(A)


TITLE: HETF I\DCC\OLD MG AC\ECS AC
UNWEIGHTED SPL (dB)
A-WEIGHTED SL (dB(A))
LEVEL
90
80
70
60
50
40
30
20
10
2.5
3.15
4
5
6.3
8
10
12.5
16
20
25
31.5
40
50
63
80
100
125
160
200
250
315
400
500
630
800
1K
1.25K
1.6K
2K
2.5K
3.15K
4K
5K
6.3K
8K
10K
OVERALL
ONE-THIRD OCTAVE BAND CENTER FREQUENCY (Hz)

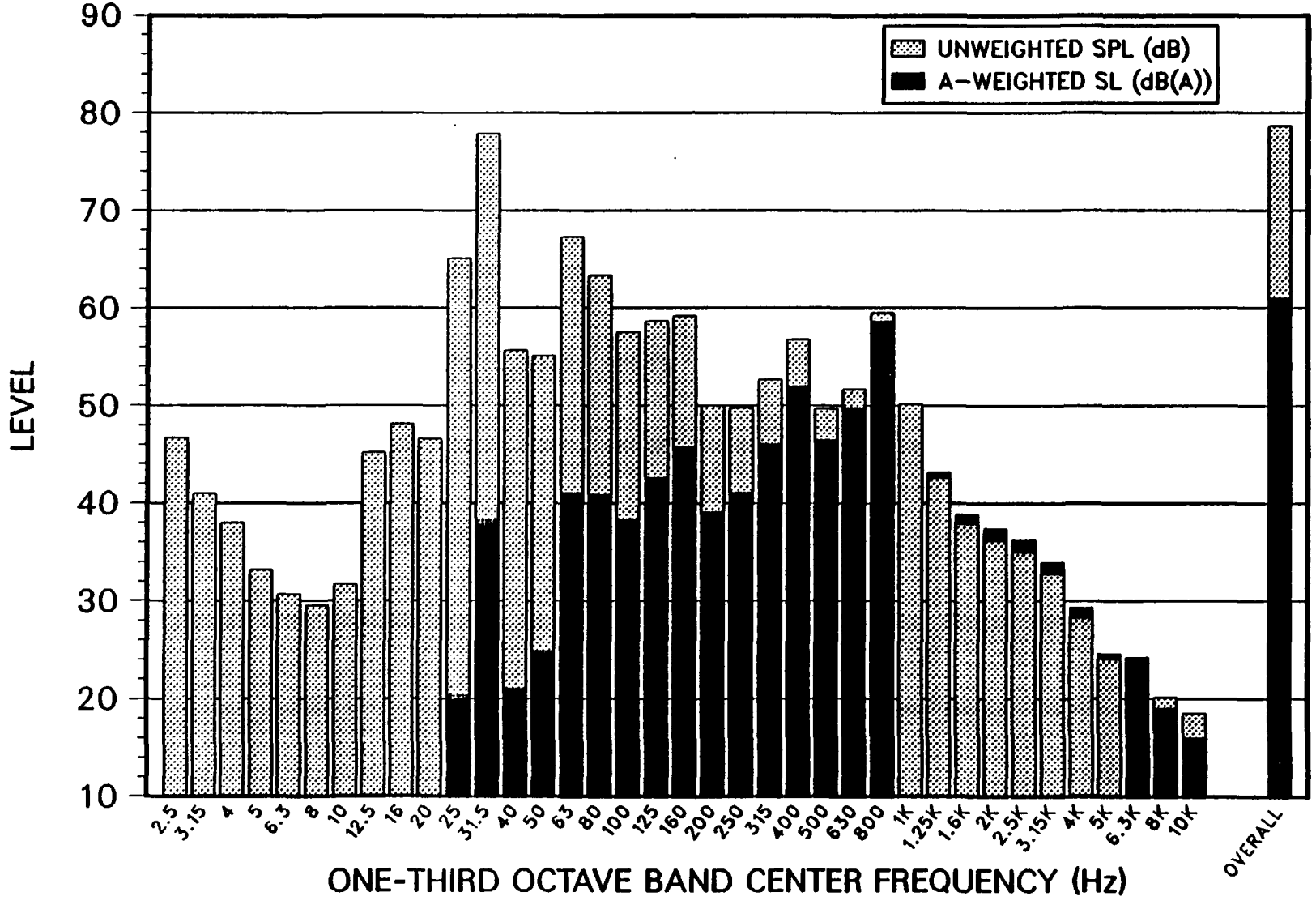
TITLE: HETF I\CC\OLD MG AC\ECS OFF

FREQ (Hz)	SOUND PRESSURE LEVEL (dB)	OCTAVE BAND SPL (dB)	A-WEIGHTED SOUND LEVEL [dB(A)]	A-WEIGHTED OCTAVE BAND SL [dB(A)]
2.5	46.7		0	
3.15	41		0	
4	38	43	0	0
5	33.2		0	
6.3	30.7		0	
8	29.5	35.3	0	0
10	31.7		0	
12.5	45.2		0	
16	48.1	51.4	0	0
20	46.6		0	
25	65.1		20.4	
31.5	77.9	77.9	38.4	38.4
40	55.7		21.1	
50	55.1		24.9	
63	67.3	68.8	41.1	43.8
80	63.4		40.9	
100	57.6		38.4	
125	58.7	63.1	42.6	47.8
160	59.2		45.8	
200	50		39.1	
250	49.8	55.6	41.1	47.7
315	52.7		46.1	
400	56.8		52	
500	49.7	58.4	46.5	54.6
630	51.7		49.8	
800	59.5		58.7	
1,000	50.2	59.9	50.2	59.2
1,250	42.6		43.2	
1,600	37.9		38.9	
2,000	36.2	41.1	37.4	42.2
2,500	35		36.3	
3,150	32.8		34	
4,000	28.3	34.3	29.3	35.4
5,000	24.1		24.6	
6,300	24.2		24.1	
8,000	20.1	26.2	19	25.5
10,000	18.5		16	

*** OVERALL LEVELS (2.5 - 10,000 Hz) ***

OASPL = 78.7 dB OASLA = 61.1 dB(A)

TITLE: HETF I\CC\OLD MG AC\ECS OFF

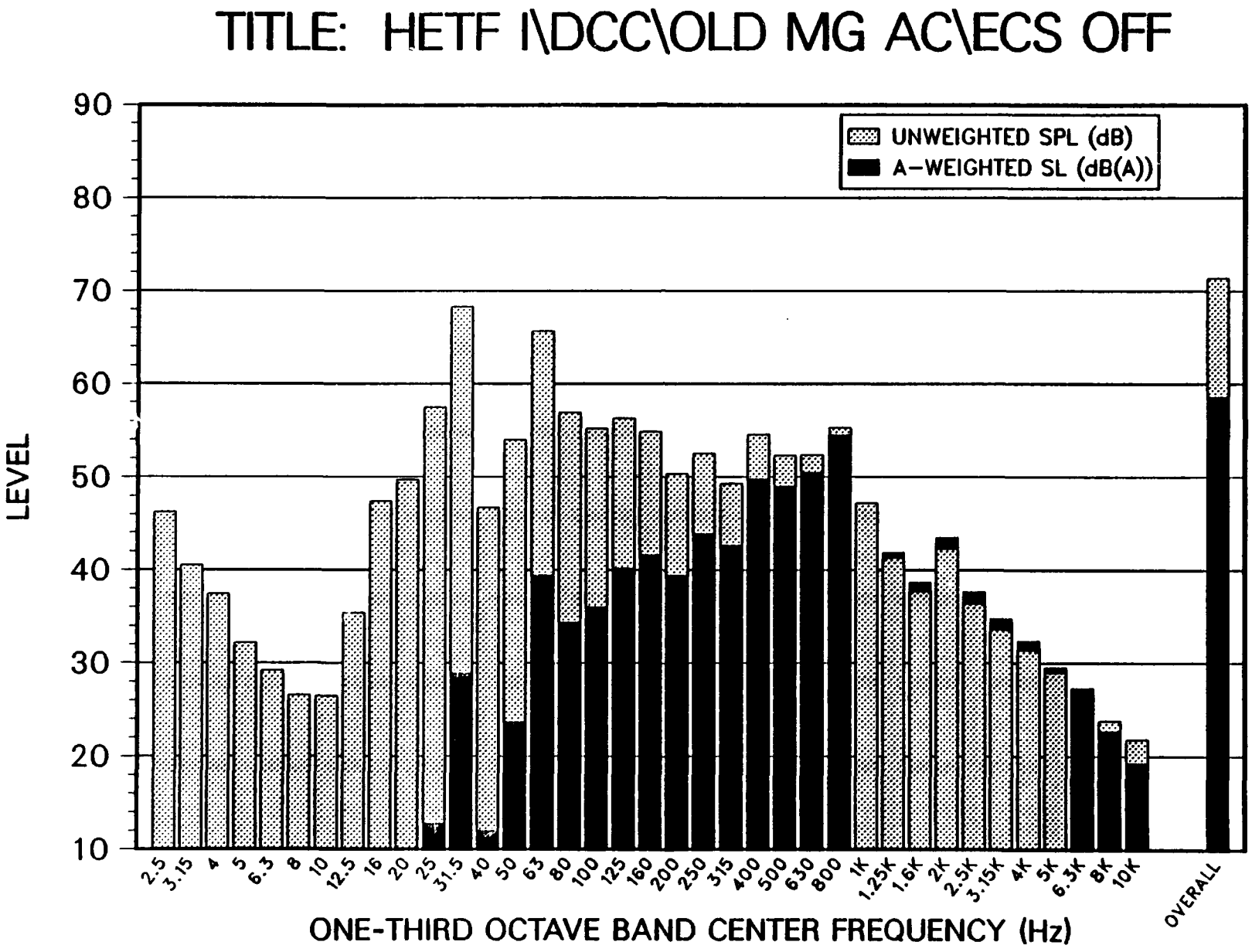


TITLE: HETF I\DCC\OLD MG AC\ECS OFF

FREQ (Hz)	SOUND PRESSURE LEVEL (dB)	OCTAVE BAND SPL (dB)	A-WEIGHTED SOUND LEVEL [dB(A)]	A-WEIGHTED OCTAVE BAND SL [dB(A)]
2.5	46.2		0	
3.15	40.5		0	
4	37.4	42.4	0	0
5	32.2		0	
6.3	29.2		0	
8	26.6	32.2	0	0
10	26.5		0	
12.5	35.4		0	
16	47.4	51.6	0	0
20	49.7		0	
25	57.5		12.8	
31.5	68.3	68.5	28.9	28.9
40	46.7		12	
50	54		23.7	
63	65.7	66.3	39.5	40.6
80	56.9		34.4	
100	55.2		36	
125	56.3	60.1	40.2	44.4
160	54.9		41.6	
200	50.3		39.4	
250	52.5	55.5	43.9	46.9
315	49.3		42.7	
400	54.6		49.8	
500	52.3	57.8	49	54.4
630	52.4		50.5	
800	55.3		54.5	
1,000	47.2	55.9	47.2	55.3
1,250	41.3		41.9	
1,600	37.7		38.7	
2,000	42.3	44.2	43.5	45.4
2,500	36.4		37.7	
3,150	33.6		34.8	
4,000	31.4	36.3	32.4	37.3
5,000	29		29.5	
6,300	27.3		27.2	
8,000	23.8	29.5	22.7	28.8
10,000	21.8		19.3	

••• OVERALL LEVELS (2.5 - 10,000 Hz) •••

OASPL = 71.4 dB OASLA = 58.7 dB(A)


TITLE: HETF I\DCC\OLD MG AC\ECS OFF
UNWEIGHTED SPL (dB)
A-WEIGHTED SL (dB(A))
LEVEL
90
80
70
60
50
40
30
20
10
2.5
3.15
4
5
6.3
8
10
12.5
16
20
25
31.5
40
50
63
80
100
125
160
200
250
315
400
500
630
800
1K
1.25K
1.6K
2K
2.5K
3.15K
4K
5K
6.3K
8K
10K
OVERALL
ONE-THIRD OCTAVE BAND CENTER FREQUENCY (Hz)

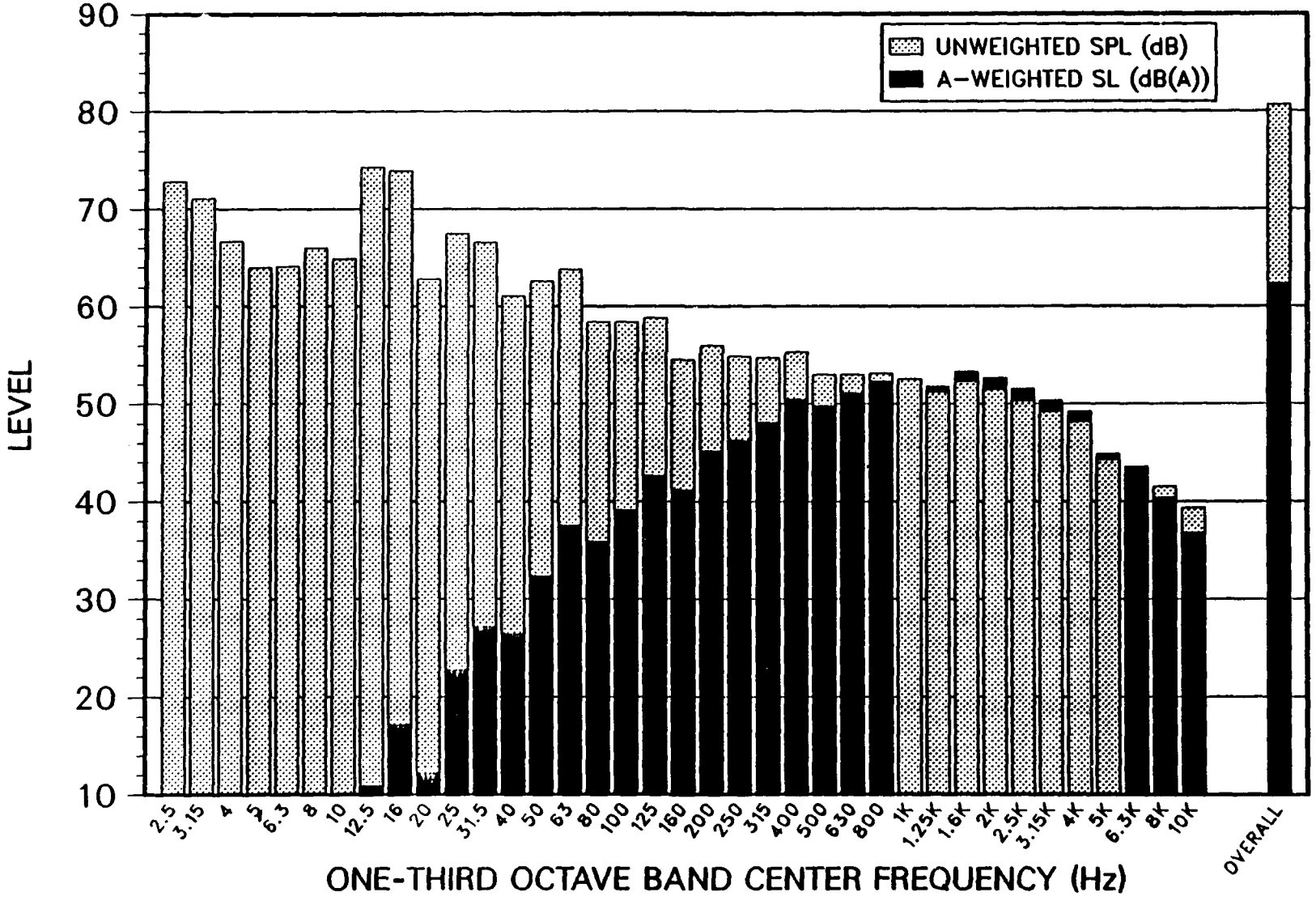
TITLE: HETF I\CC\OLD MG OFF\ECS AC

FREQ (Hz)	SOUND PRESSURE LEVEL (dB)	OCTAVE BAND SPL (dB)	A-WEIGHTED SOUND LEVEL [dB(A)]	A-WEIGHTED OCTAVE BAND SL [dB(A)]
2.5	72.8		0	
3.15	71.1		0	
4	66.7	72.8	0	0
5	64		0	
6.3	64.1		0	
8	66	69.6	0	0
10	64.9		0	
12.5	74.3		10.9	
16	73.9	77.1	17.2	19
20	62.8		12.3	
25	67.5		22.8	
31.5	66.6	70.4	27.2	30.4
40	61.1		26.5	
50	62.6		32.4	
63	63.8	66.7	37.6	40.4
80	58.4		35.9	
100	58.4		39.2	
125	58.8	62.2	42.7	45.9
160	54.5		41.2	
200	56		45.2	
250	54.9	59.8	46.3	51.3
315	54.7		48.1	
400	55.3		50.5	
500	53	58.5	49.8	55.1
630	53		51.1	
800	53.1		52.3	
1,000	52.5	56.9	52.5	56.8
1,250	51.2		51.8	
1,600	52.3		53.3	
2,000	51.5	56	52.7	57.2
2,500	50.3		51.6	
3,150	49.2		50.4	
4,000	48.2	52.3	49.2	53.3
5,000	44.3		44.9	
6,300	43.6		43.5	
8,000	41.5	46.4	40.4	45.6
10,000	39.3		36.8	

••• OVERALL LEVELS (2.5 - 10,000 Hz) •••

OASPL = 80.7 dB OASLA = 62.4 dB(A)

TITLE: HETF I\CC\OLD MG OFF\ECS AC

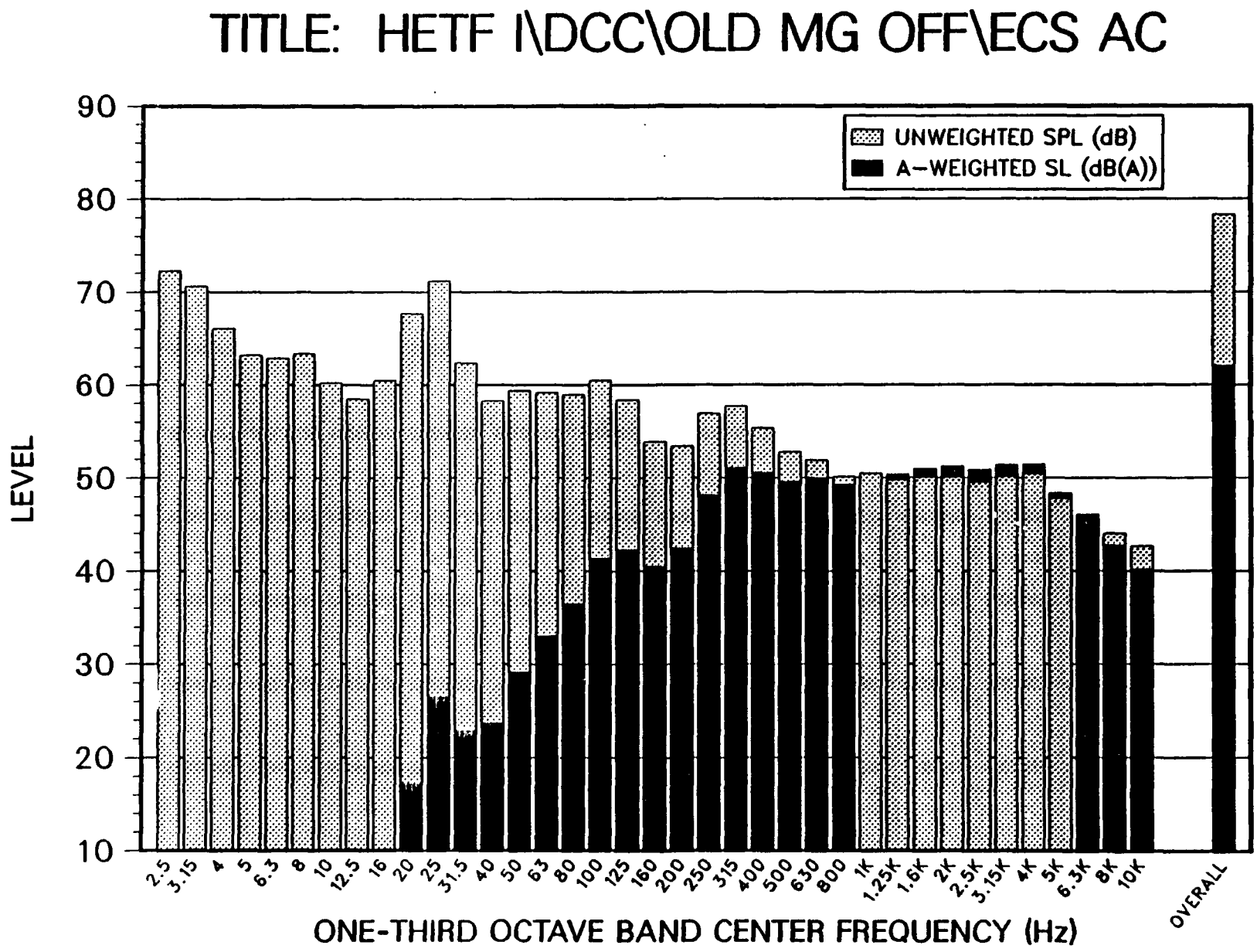


TITLE: HETF I\DCC\OLD MG OFF\ECS AC

FREQ (Hz)	SOUND PRESSURE LEVEL (dB)	OCTAVE BAND SPL (dB)	A-WEIGHTED SOUND LEVEL [dB(A)]	A-WEIGHTED OCTAVE BAND SL [dB(A)]
2.5	72.3		0	
3.15	70.6		0	
4	66.1	72.3	0	0
5	63.2		0	
6.3	62.9		0	
8	63.4	66.9	0	0
10	60.2		0	
12.5	58.5		0	
16	60.5	68.7	3.8	17.2
20	67.7		17.2	
25	71.2		26.5	
31.5	62.4	71.8	22.9	29.3
40	58.3		23.7	
50	59.4		29.2	
63	59.2	63.8	33	38.4
80	59		36.5	
100	60.5		41.4	
125	58.4	63	42.3	46
160	53.9		40.5	
200	53.4		42.5	
250	56.9	60.9	48.2	53.1
315	57.7		51.1	
400	55.4		50.6	
500	52.8	58.2	49.6	54.7
630	51.9		50	
800	50.1		49.3	
1,000	50.5	54.7	50.5	54.7
1,250	49.8		50.4	
1,600	50.1		51	
2,000	50.1	54.5	51.3	55.7
2,500	49.6		50.9	
3,150	50.2		51.4	
4,000	50.5	54.2	51.5	55.2
5,000	47.8		48.4	
6,300	46.1		46	
8,000	44	49.1	42.8	48.2
10,000	42.7		40.2	

••• OVERALL LEVELS (2.5 - 10,000 Hz) •••

OASPL = 78.3 dB OASLA = 62.1 dB(A)


TITLE: HETF I\DCC\OLD MG OFF\ECS AC
UNWEIGHTED SPL (dB)
A-WEIGHTED SL (dB(A))
LEVEL
90
80
70
60
50
40
30
20
10
2.5
3.15
4
5
6.3
8
10
12.5
16
20
25
31.5
40
50
63
80
100
125
160
200
250
315
400
500
630
800
1K
1.25K
1.6K
2K
2.5K
3.15K
4K
5K
6.3K
8K
10K
OVERALL
ONE-THIRD OCTAVE BAND CENTER FREQUENCY (Hz)

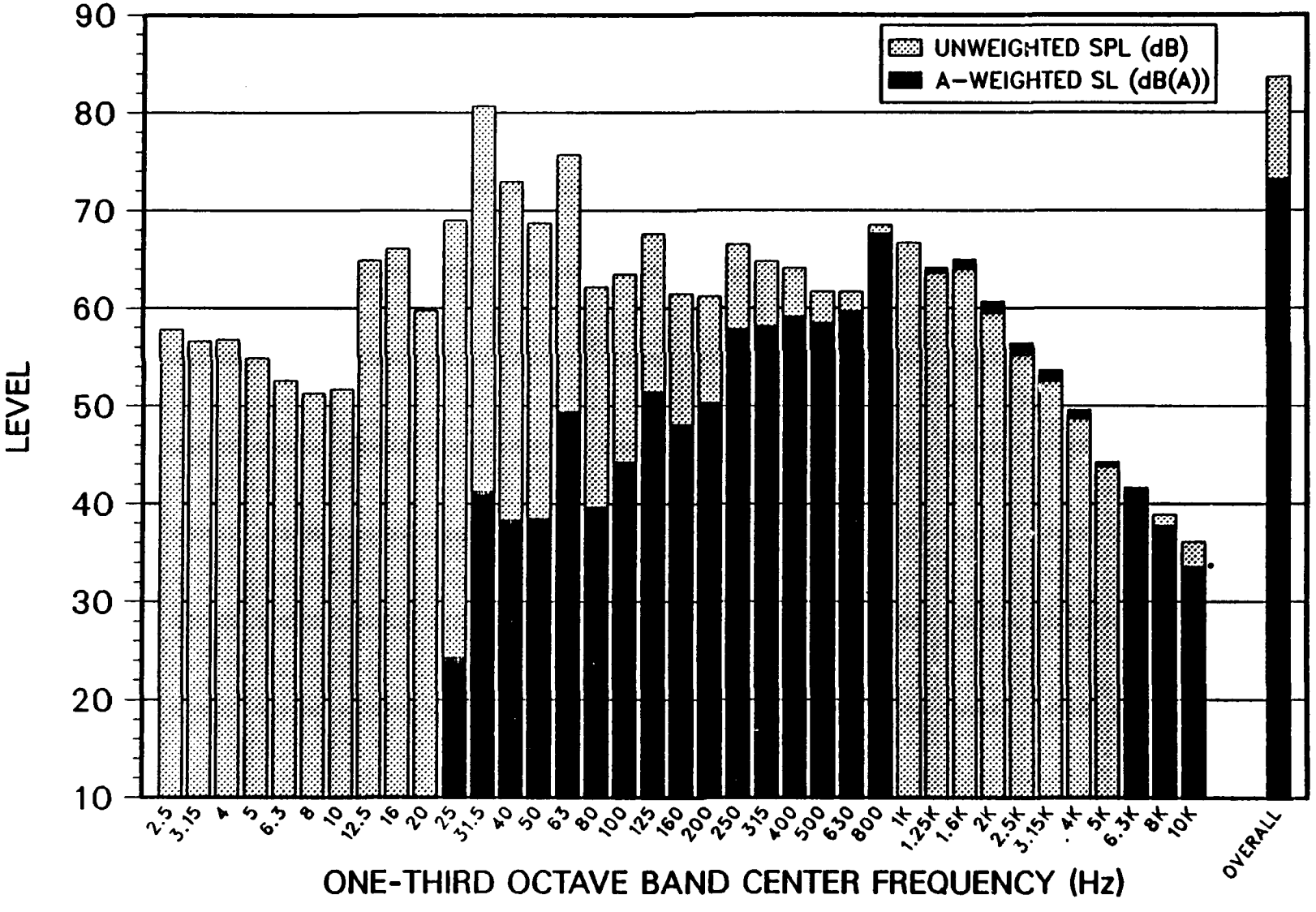
TITLE: HETF I\CC\OLD MG DC\ECS DC

FREQ (Hz)	SOUND PRESSURE LEVEL (dB)	OCTAVE BAND SPL (dB)	A-WEIGHTED SOUND LEVEL [dB(A)]	A-WEIGHTED OCTAVE BAND SL [dB(A)]
2.5	57.8		0	
3.15	56.6		0	
4	56.8	60.7	0	0
5	54.9		0	
6.3	52.6		0	
8	51.3	56.5	0	0
10	51.7		0	
12.5	64.9		1.5	
16	66.1	68.9	9.4	12.5
20	59.8		9.4	
25	69		24.3	
31.5	80.7	81.4	41.3	42.9
40	73		38.4	
50	68.7		38.5	
63	75.7	76.5	49.5	50.1
80	62.2		39.7	
100	63.5		44.3	
125	67.6	69.5	51.5	53.5
160	61.5		48.1	
200	61.2		50.3	
250	66.5	69.3	57.9	61.2
315	64.8		58.2	
400	64.1		59.2	
500	61.7	67.2	58.5	63.8
630	61.7		59.8	
800	68.5		67.7	
1,000	66.7	71.3	66.7	71
1,250	63.6		64.2	
1,600	64		65	
2,000	59.5	65.6	60.7	66.6
2,500	55.2		56.5	
3,150	52.5		53.7	
4,000	48.7	54.2	49.6	55.3
5,000	43.8		44.3	
6,300	41.7		41.6	
8,000	38.9	44.1	37.8	43.4
10,000	36.1		33.6	

*** OVERALL LEVELS (2.5 - 10,000 Hz) ***

OASPL = 83.7 dB OASLA = 73.3 dB(A)

TITLE: HETF I\CC\OLD MG DC\ECS DC



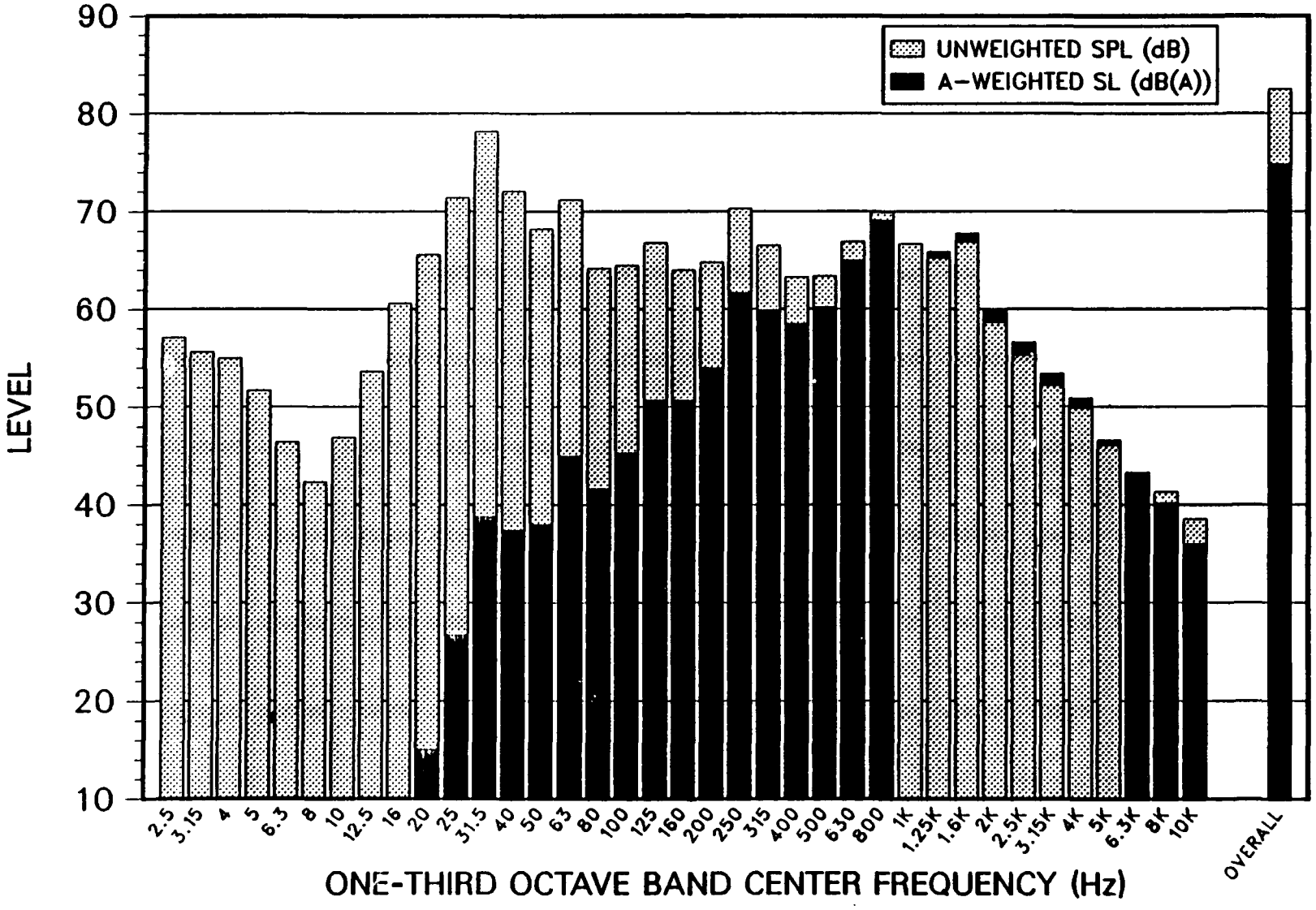
TITLE: HETF I\DCC\OLD MG DC\ECS DC

FREQ (Hz)	SOUND PRESSURE LEVEL (dB)	OCTAVE BAND SPL (dB)	A-WEIGHTED SOUND LEVEL [dB(A)]	A-WEIGHTED OCTAVE BAND SL [dB(A)]
2.5	57.1		0	
3.15	55.6		0	
4	55	59	0	0
5	51.7		0	
6.3	46.4		0	
8	42.3	50.2	0	0
10	46.9		0	
12.5	53.6		0	
16	60.6	66.8	3.9	15.3
20	65.6		15.1	
25	71.4		26.7	
31.5	78.2	79.6	38.8	41.1
40	72.1		37.4	
50	68.2		38	
63	71.2	73.3	45	47
80	64.2		41.6	
100	64.5		45.3	
125	66.8	69.9	50.7	54.1
160	64		50.7	
200	64.8		54	
250	70.3	72.4	61.7	64.1
315	66.5		59.9	
400	63.3		58.5	
500	63.4	69.5	60.2	66.7
630	66.9		65	
800	69.9		69.1	
1,000	66.7	72.3	66.7	72
1,250	65.3		65.9	
1,600	66.9		67.8	
2,000	58.7	67.6	59.9	68.6
2,500	55.3		56.6	
3,150	52.2		53.4	
4,000	49.9	54.7	50.9	55.7
5,000	46.1		46.6	
6,300	43.3		43.2	
8,000	41.3	46	40.2	45.3
10,000	38.5		36	

*** OVERALL LEVELS (2.5 - 10,000 Hz) ***

OASPL = 82.5 dB OASLA = 74.9 dB(A)

TITLE: HETF I\DCC\OLD MG DC\ECS DC



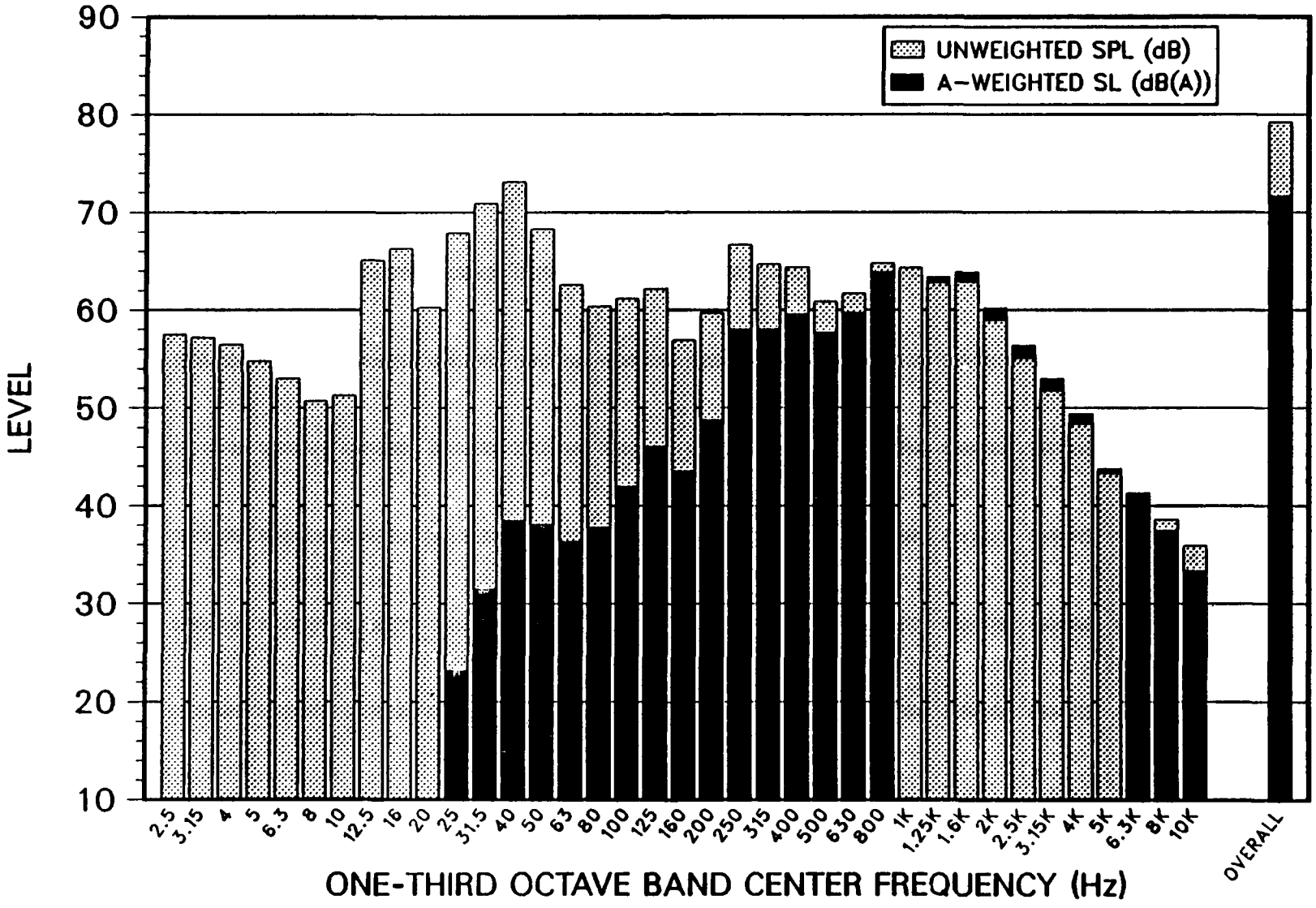
TITLE: HETF I\CC\OLD MG OFF\ECS DC

FREQ (Hz)	SOUND PRESSURE LEVEL (dB)	OCTAVE BAND SPL (dB)	A-WEIGHTED SOUND LEVEL [dB(A)]	A-WEIGHTED OCTAVE BAND SL [dB(A)]
2.5	57.5		0	
3.15	57.2		0	
4	56.5	60.8	0	0
5	54.8		0	
6.3	53		0	
8	50.7	56.3	0	0
10	51.3		0	
12.5	65.1		1.7	
16	66.3	69.1	9.6	12.9
20	60.3		9.9	
25	67.9		23.2	
31.5	70.9	75.7	31.5	39.2
40	73.1		38.5	
50	68.3		38.1	
63	62.6	69.7	36.4	42.1
80	60.4		37.8	
100	61.2		42	
125	62.2	65.2	46.1	48.8
160	56.9		43.6	
200	59.7		48.8	
250	66.7	69.1	58.1	61.2
315	64.7		58.1	
400	64.4		59.6	
500	60.9	67.2	57.7	63.7
630	61.7		59.8	
800	64.8		63.9	
1,000	64.3	68.6	64.3	68.5
1,250	62.8		63.4	
1,600	62.9		63.9	
2,000	59	64.7	60.2	65.7
2,500	55.1		56.4	
3,150	51.8		53	
4,000	48.4	53.7	49.4	54.8
5,000	43.3		43.8	
6,300	41.3		41.2	
8,000	38.6	43.7	37.5	43
10,000	35.9		33.4	

*** OVERALL LEVELS (2.5 - 10,000 Hz) ***

OASPL = 79.2 dB OASLA = 71.7 dB(A)

TITLE: HETF I\CC\OLD MG OFF\ECS DC



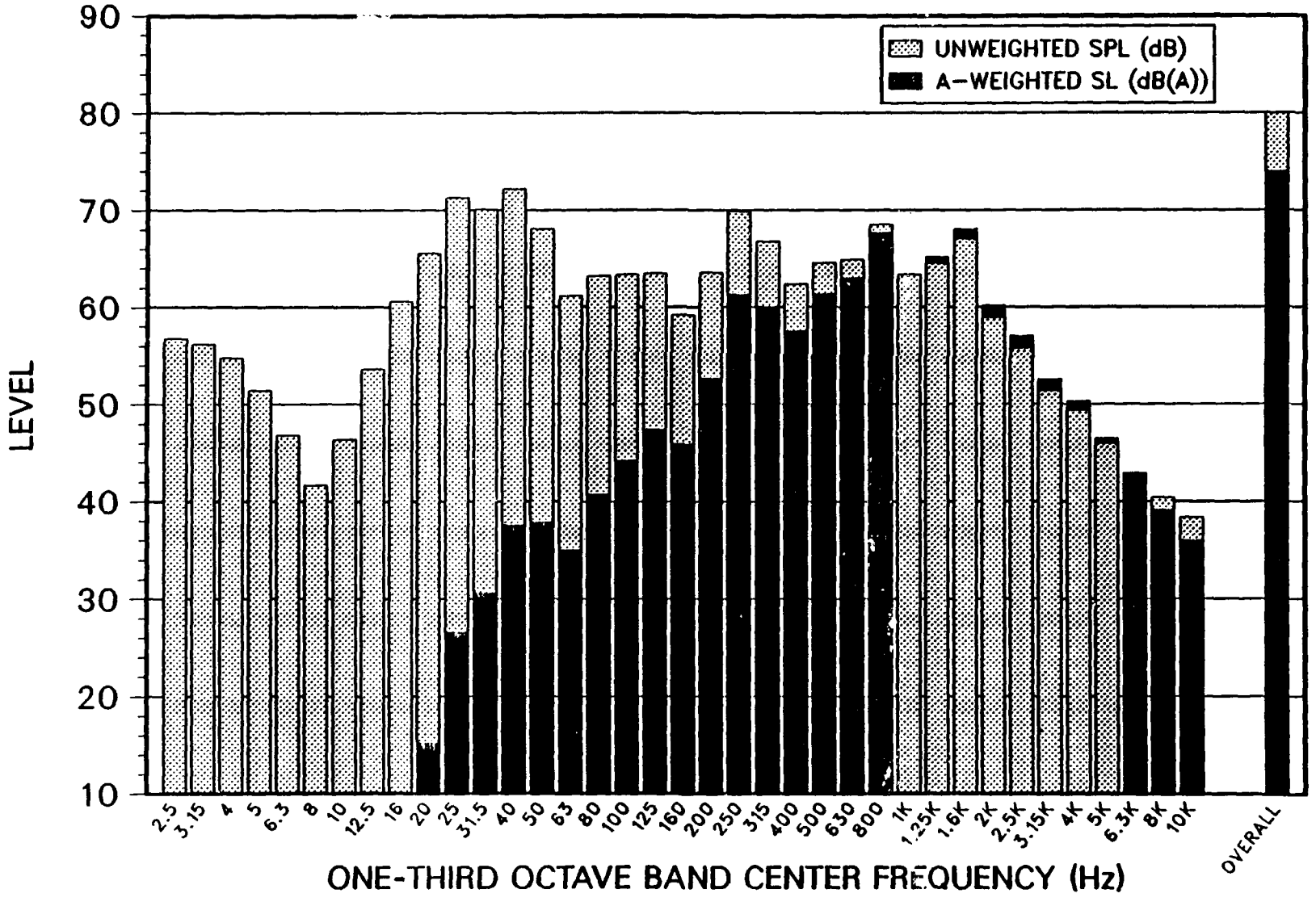
TITLE: HETF I\DCC\OLD MG OFF\ECS DC

FREQ (Hz)	SOUND PRESSURE LEVEL (dB)	OCTAVE BAND SPL (dB)	A-WEIGHTED SOUND LEVEL [dB(A)]	A-WEIGHTED OCTAVE BAND SL [dB(A)]
2.5	56.8		0	
3.15	56.2		0	
4	54.8	59.1	0	0
5	51.4		0	
6.3	46.8		0	
8	41.7	50.1	0	0
10	46.4		0	
12.5	53.6		0	
16	60.6	66.8	3.9	15.3
20	65.6		15.2	
25	71.3		26.6	
31.5	70.1	75.9	30.6	38.5
40	72.2		37.6	
50	68.1		37.9	
63	61.2	69.8	35	43.1
80	63.2		40.7	
100	63.4		44.2	
125	63.5	67	47.4	50.6
160	59.2		45.9	
200	63.6		52.7	
250	69.9	72.1	61.3	63.9
315	66.8		60.1	
400	62.4		57.6	
500	64.6	68.7	61.4	65.8
630	64.9		63	
800	68.5		67.7	
1,000	63.4	70.7	63.4	70.4
1,250	64.6		65.2	
1,600	67.1		68.1	
2,000	59	67.8	60.2	68.9
2,500	55.8		57.1	
3,150	51.4		52.6	
4,000	49.4	54	50.3	55.1
5,000	46		46.5	
6,300	42.9		42.8	
8,000	40.4	45.5	39.2	44.8
10,000	38.4		36	

*** OVERALL LEVELS (2.5 - 10,000 Hz) ***

OASPL = 80 dB OASLA = 74 dB(A)

TITLE: HETF I\DCC\OLD MG OFF\ECS DC



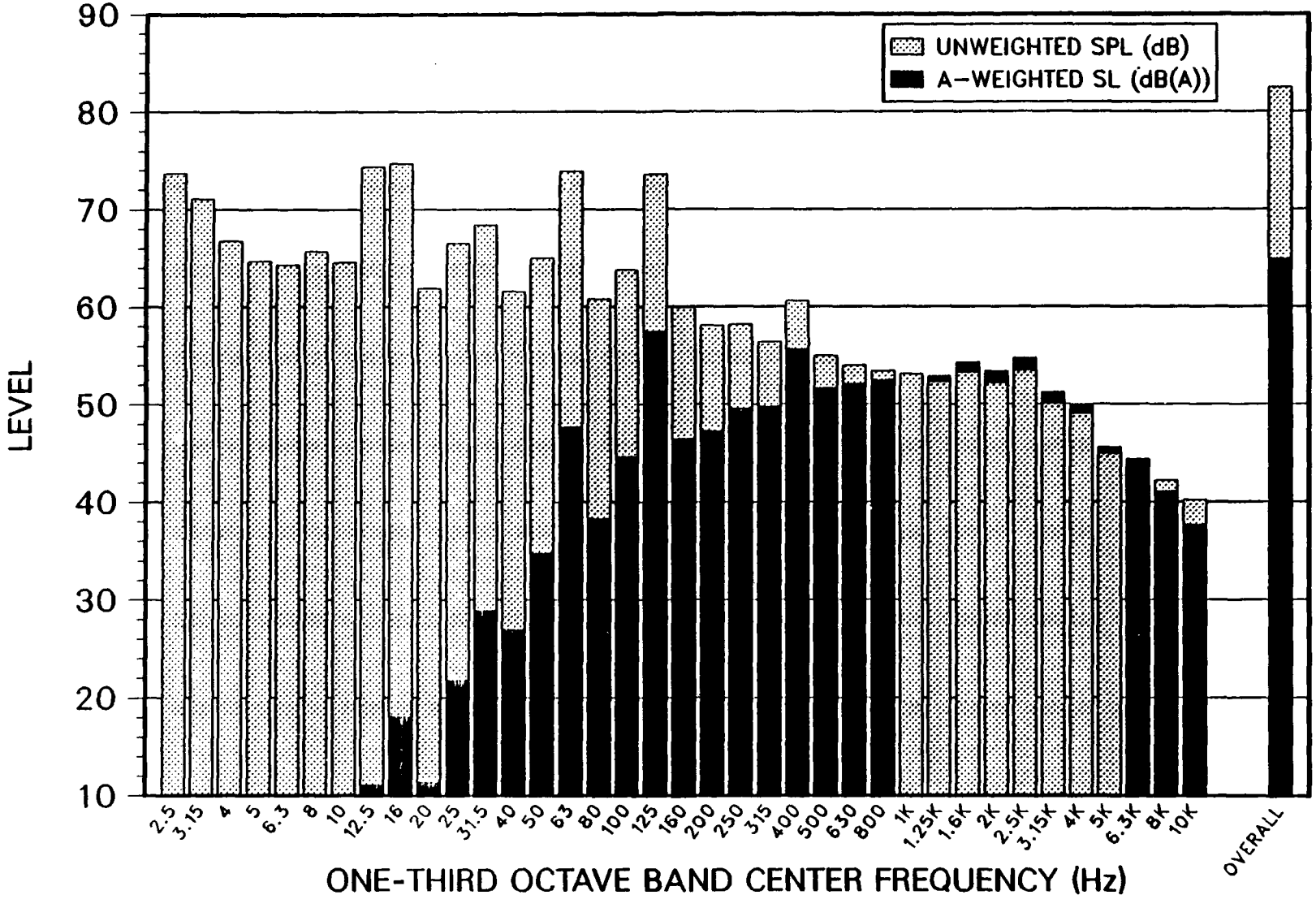
TITLE: HETF I\CC\NEW MG AC\ECS AC

FREQ (Hz)	SOUND PRESSURE LEVEL (dB)	OCTAVE BAND SPL (dB)	A-WEIGHTED SOUND LEVEL [dB(A)]	A-WEIGHTED OCTAVE BAND SL [dB(A)]
2.5	73.7		0	
3.15	71.1		0	
4	66.8	72.9	0	0
5	64.7		0	
6.3	64.3		0	
8	65.7	69.5	0	0
10	64.6		0	
12.5	74.4		11.1	
16	74.7	77.5	18.1	19.4
20	61.9		11.4	
25	66.5		21.8	
31.5	68.4	70.9	28.9	31.4
40	61.6		27	
50	65		34.8	
63	73.9	74.4	47.7	48.1
80	60.8		38.3	
100	63.8		44.7	
125	73.6	74	57.5	57.8
160	59.9		46.5	
200	58.1		47.3	
250	58.2	62.2	49.6	53.6
315	58.4		49.8	
400	60.6		55.7	
500	55	62.1	51.7	58.2
630	54		52.1	
800	53.4		52.5	
1,000	53.1	57.5	53.1	57.4
1,250	52.3		52.9	
1,600	53.3		54.3	
2,000	52.2	57.6	53.4	58.8
2,500	53.5		54.8	
3,150	50.1		51.3	
4,000	49.1	53.1	50	54.2
5,000	45		45.6	
6,300	44.4		44.3	
8,000	42.2	47.2	41.1	46.4
10,000	40.2		37.7	

*** OVERALL LEVELS (2.5 - 10,000 Hz) ***

OASPL = 82.5 dB OASLA = 66 dB(A)

TITLE: HETF I\CC\NEW MG AC\ECS AC



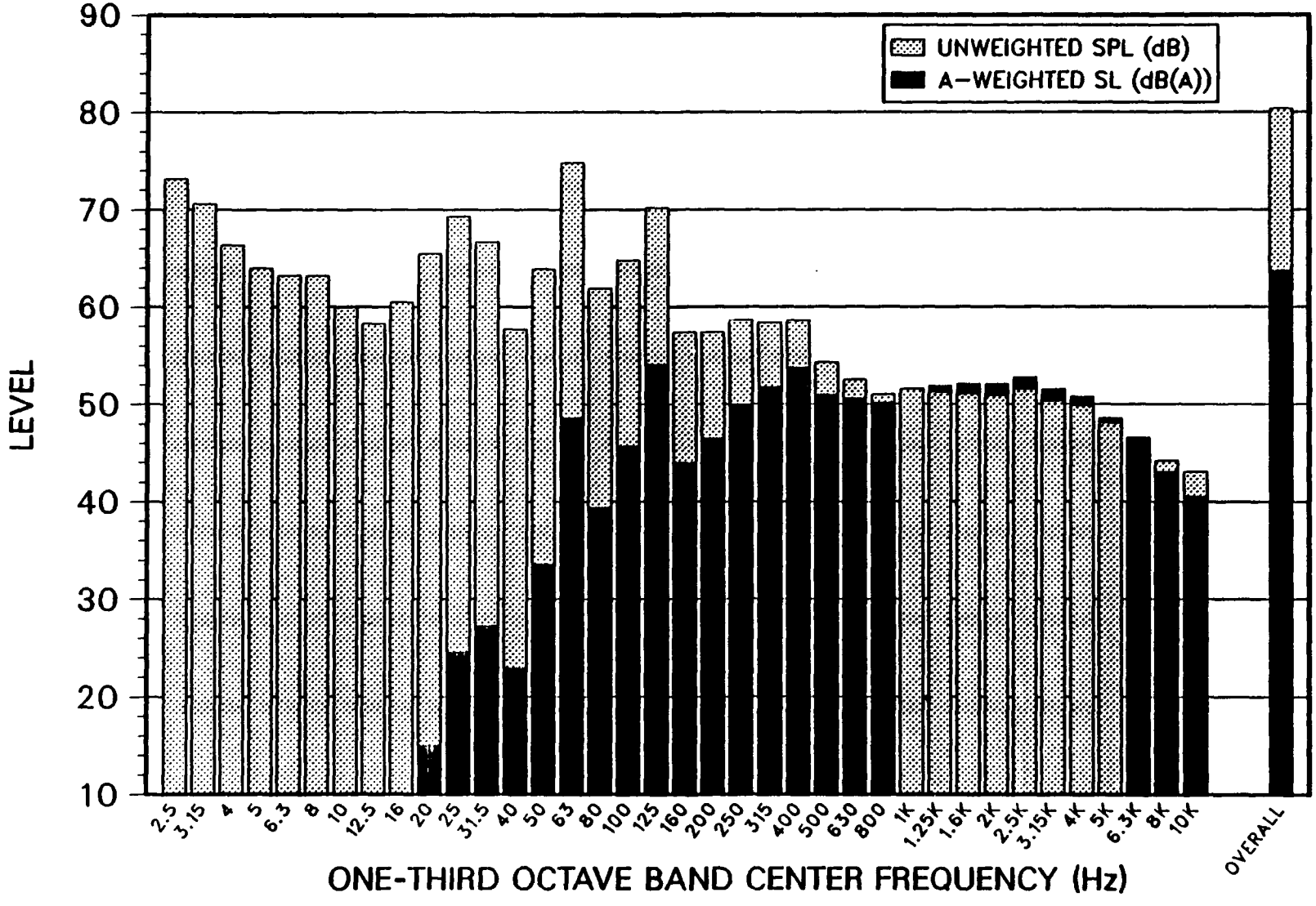
TITLE: HETF I\DCC\NEW MG AC\ECS AC

FREQ (Hz)	SOUND PRESSURE LEVEL (dB)	OCTAVE BAND SPL (dB)	A-WEIGHTED SOUND LEVEL [dB(A)]	A-WEIGHTED OCTAVE BAND SL [dB(A)]
2.5	73.2		0	
3.15	70.6		0	
4	66.4	72.4	0	0
5	64		0	
6.3	63.2		0	
8	63.2	67	0	0
10	60		0	
12.5	58.3		0	
16	60.5	67.1	3.8	15.2
20	65.5		15	
25	69.3		24.6	
31.5	66.7	71.2	27.3	29.9
40	57.7		23	
50	63.9		33.6	
63	74.8	75.1	48.6	49
80	61.9		39.4	
100	64.8		45.7	
125	70.2	71.3	54.1	54.9
160	57.4		44	
200	57.4		46.5	
250	58.7	62.8	50	54.5
315	58.4		51.8	
400	58.6		53.8	
500	54.3	60.5	51	56.6
630	52.5		50.6	
800	51		50.2	
1,000	51.6	55.9	51.6	55.9
1,250	51.3		51.9	
1,600	51.1		52.1	
2,000	50.9	55.8	52.1	56.9
2,500	51.6		52.8	
3,150	50.4		51.6	
4,000	49.9	54.1	50.8	55.1
5,000	48.1		48.6	
6,300	46.6		46.5	
8,000	44.2	49.5	43.1	48.7
10,000	43.1		40.6	

*** OVERALL LEVELS (2.5 - 10,000 Hz) ***

OASPL = 80.4 dB OASLA = 63.8 dB(A)

TITLE: HETF I\DCC\NEW MG AC\ECS AC



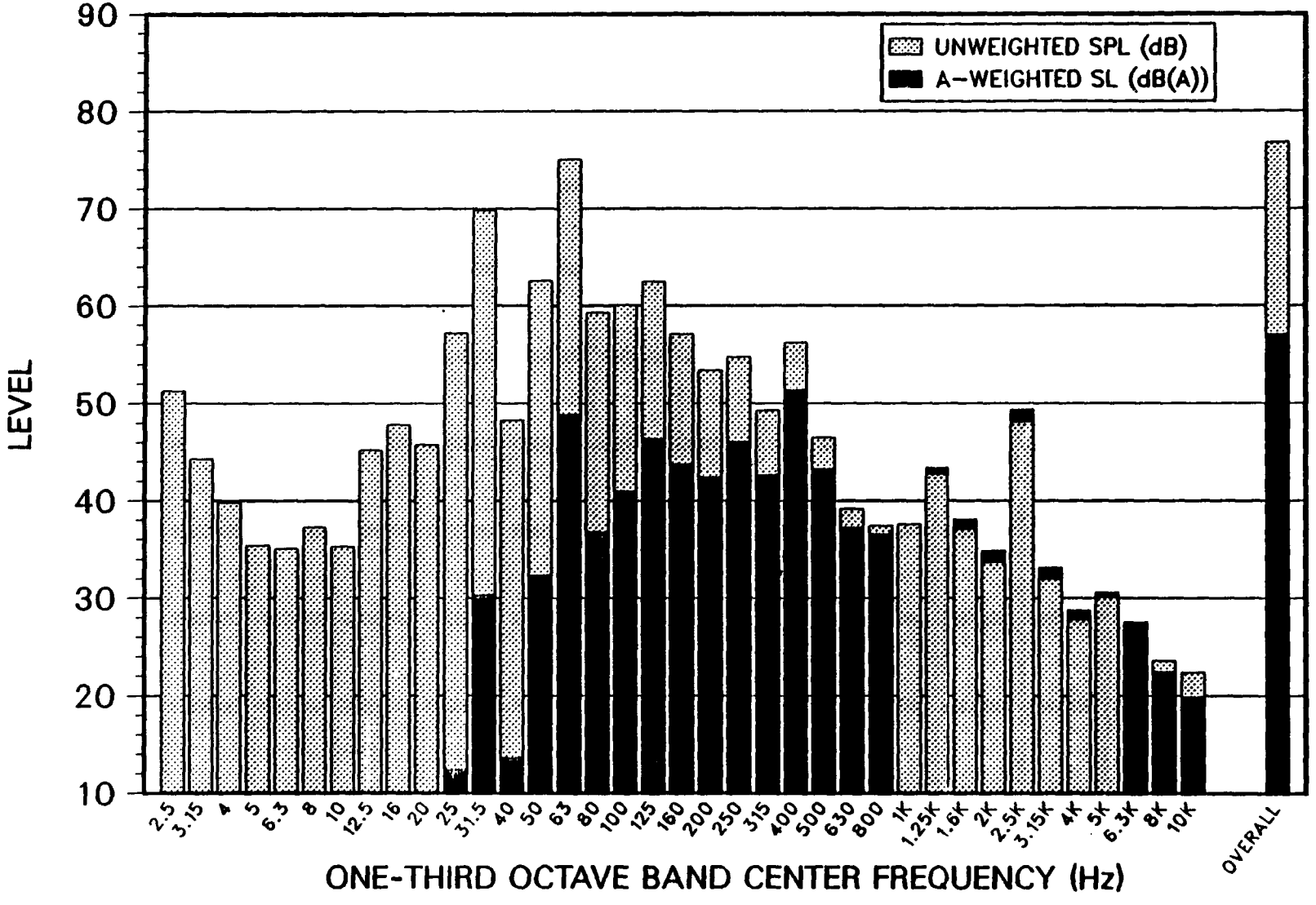
TITLE: HETF I\CC\NEW MG AC\ECS OFF

FREQ (Hz)	SOUND PRESSURE LEVEL (dB)	OCTAVE BAND SPL (dB)	A-WEIGHTED SOUND LEVEL [dB(A)]	A-WEIGHTED OCTAVE BAND SL [dB(A)]
2.5	51.3		0	
3.15	44.3		0	
4	39.8	45.8	0	0
5	35.4		0	
6.3	35.1		0	
8	37.3	40.6	0	0
10	35.3		0	
12.5	45.2		0	
16	47.8	51	0	0
20	45.8		0	
25	57.2		12.5	
31.5	69.8	69.9	30.4	30.4
40	48.3		13.7	
50	62.6		32.4	
63	75.1	75.3	48.9	49.1
80	59.3		36.8	
100	60.1		41	
125	62.5	65	46.4	48.8
160	57.1		43.8	
200	53.4		42.5	
250	54.8	57.6	46.1	48.7
315	49.3		42.7	
400	56.2		51.4	
500	46.5	56.5	43.3	52
630	39.2		37.3	
800	37.4		36.6	
1,000	37.6	44.7	37.6	44.9
1,250	42.8		43.4	
1,600	37.1		38.1	
2,000	33.7	48.4	34.9	49.6
2,500	48.1		49.4	
3,150	32		33.2	
4,000	27.8	34.8	28.8	35.8
5,000	30.1		30.6	
6,300	27.6		27.5	
8,000	23.6	29.7	22.5	29
10,000	22.4		19.9	

*** OVERALL LEVELS (2.5 - 10,000 Hz) ***

OASPL = 76.8 dB OASLA = 57.1 dB(A)

TITLE: HETF I\CC\NEW MG AC\ECS OFF



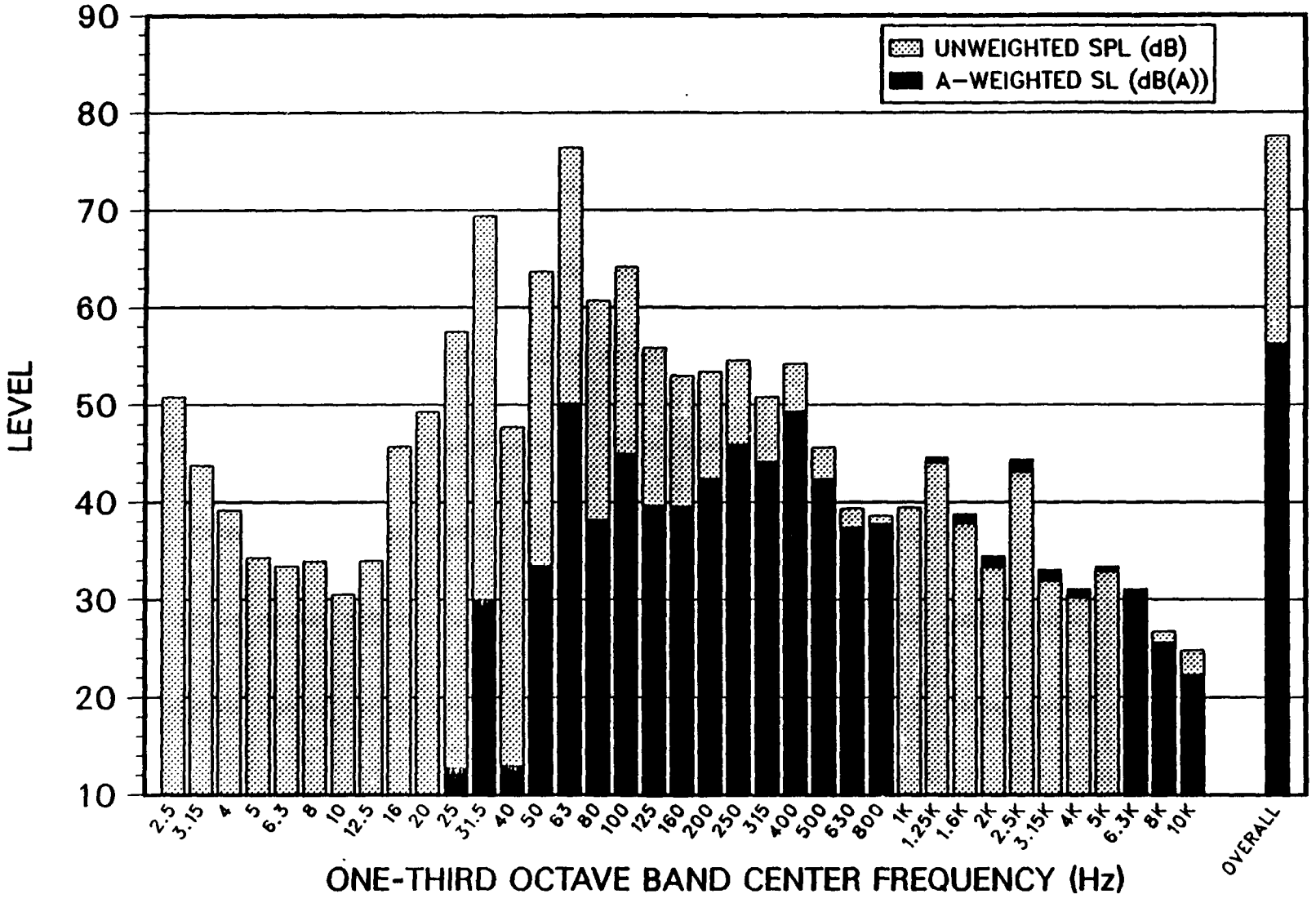
TITLE: HETF I\DCC\NEW MG AC\ECS OFF

FREQ (Hz)	SOUND PRESSURE LEVEL (dB)	OCTAVE BAND SPL (dB)	A-WEIGHTED SOUND LEVEL [dB(A)]	A-WEIGHTED OCTAVE BAND SL [dB(A)]
2.5	50.8		0	
3.15	43.8		0	
4	39.2	45.3	0	0
5	34.3		0	
6.3	33.4		0	
8	33.9	37.4	0	0
10	30.5		0	
12.5	34		0	
16	45.7	50.8	0	0
20	49.3		0	
25	57.5		12.8	
31.5	69.4	69.5	30	29.9
40	47.7		13	
50	63.7		33.5	
63	76.4	76.5	50.2	50.3
80	60.7		38.2	
100	64.2		45	
125	55.8	64.8	39.7	46.8
160	53		39.6	
200	53.4		42.5	
250	54.6	57.8	46	49
315	50.8		44.2	
400	54.2		49.4	
500	45.6	54.7	42.4	50.2
630	39.3		37.4	
800	38.6		37.8	
1,000	39.4	46	39.4	46.2
1,250	44		44.6	
1,600	37.8		38.8	
2,000	33.3	44.4	34.5	45.6
2,500	43.1		44.4	
3,150	31.9		33.1	
4,000	30.2	36.3	31.1	37.2
5,000	32.9		33.4	
6,300	31.1		31	
8,000	26.7	33	25.6	32.4
10,000	24.8		22.3	

••• OVERALL LEVELS (2.5 - 10,000 Hz) •••

OASPL = 77.6 dB OASLA = 56.3 dB(A)

TITLE: HETF I\DCC\NEW MG AC\ECS OFF



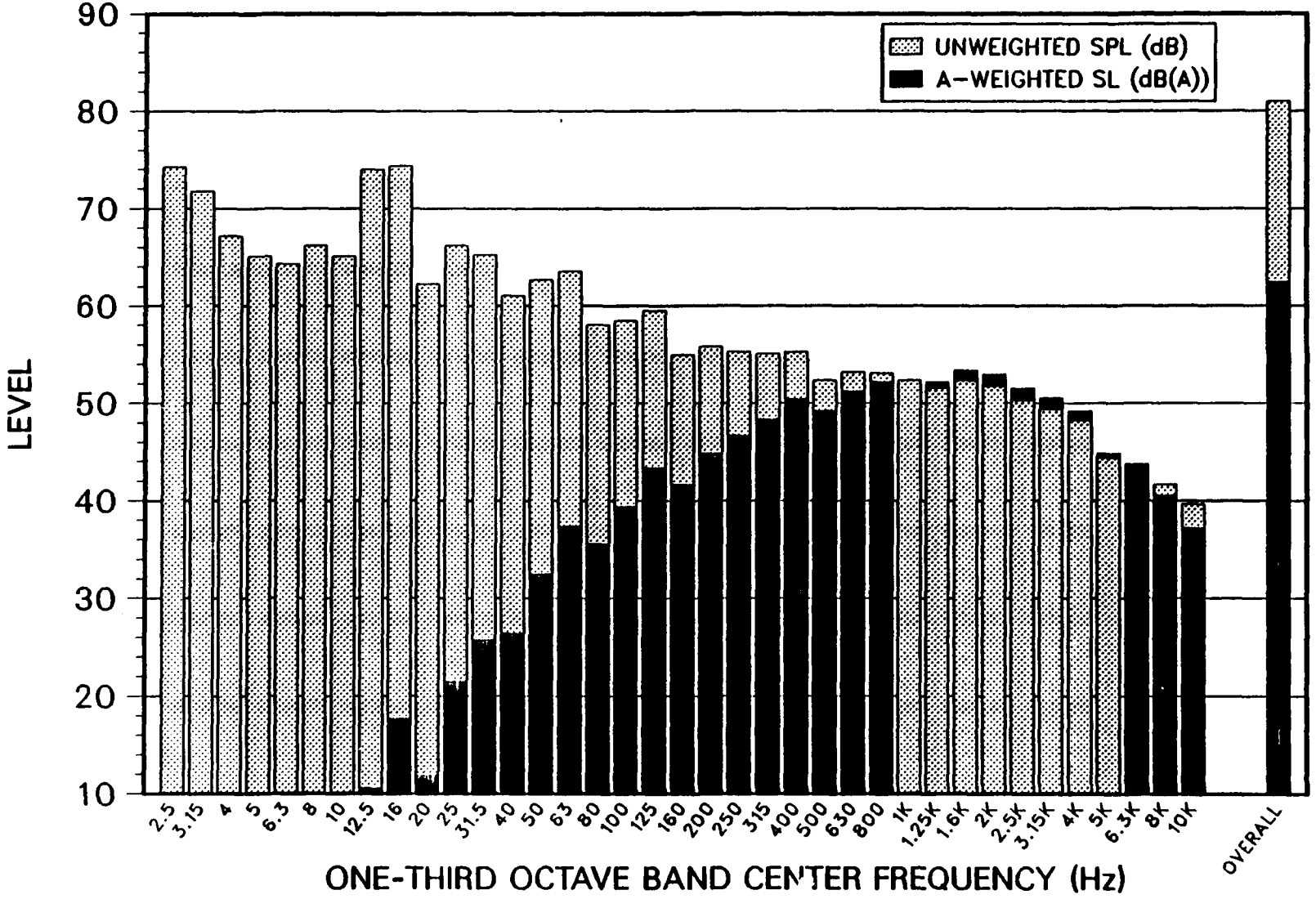
TITLE: HETF I\CC\NEW MG OFF\ECS AC

FREQ (Hz)	SOUND PRESSURE LEVEL (dB)	OCTAVE BAND SPL (dB)	A-WEIGHTED SOUND LEVEL [dB(A)]	A-WEIGHTED OCTAVE BAND SL [dB(A)]
2.5	74.3		0	
3.15	71.8		0	
4	67.2	73.5	0	0
5	65.1		0	
6.3	64.3		0	
8	66.2	69.9	0	0
10	65.1		0	
12.5	74		10.6	
16	74.4	77.1	17.7	19.1
20	62.3		11.9	
25	66.2		21.5	
31.5	65.3	69.2	25.8	29.7
40	61.1		26.5	
50	62.7		32.5	
63	63.6	66.6	37.4	40.2
80	58.1		35.6	
100	58.5		39.4	
125	59.5	62.6	43.4	46.4
160	55		41.7	
200	55.8		44.9	
250	55.3	60	46.7	51.5
315	55.1		48.4	
400	55.3		50.5	
500	52.4	58.4	49.2	55
630	53.2		51.3	
800	53.1		52.2	
1,000	52.4	57	52.4	56.8
1,250	51.6		52.2	
1,600	52.4		53.4	
2,000	51.8	56.2	53	57.3
2,500	50.3		51.6	
3,150	49.4		50.6	
4,000	48.3	52.4	49.2	53.4
5,000	44.4		44.9	
6,300	43.8		43.7	
8,000	41.7	46.6	40.6	45.8
10,000	39.6		37.2	

*** OVERALL LEVELS (2.5 - 10,000 Hz) ***

OASPL = 81 dB OASLA = 62.5 dB(A)

TITLE: HETF I\CC\NEW MG OFF\ECS AC



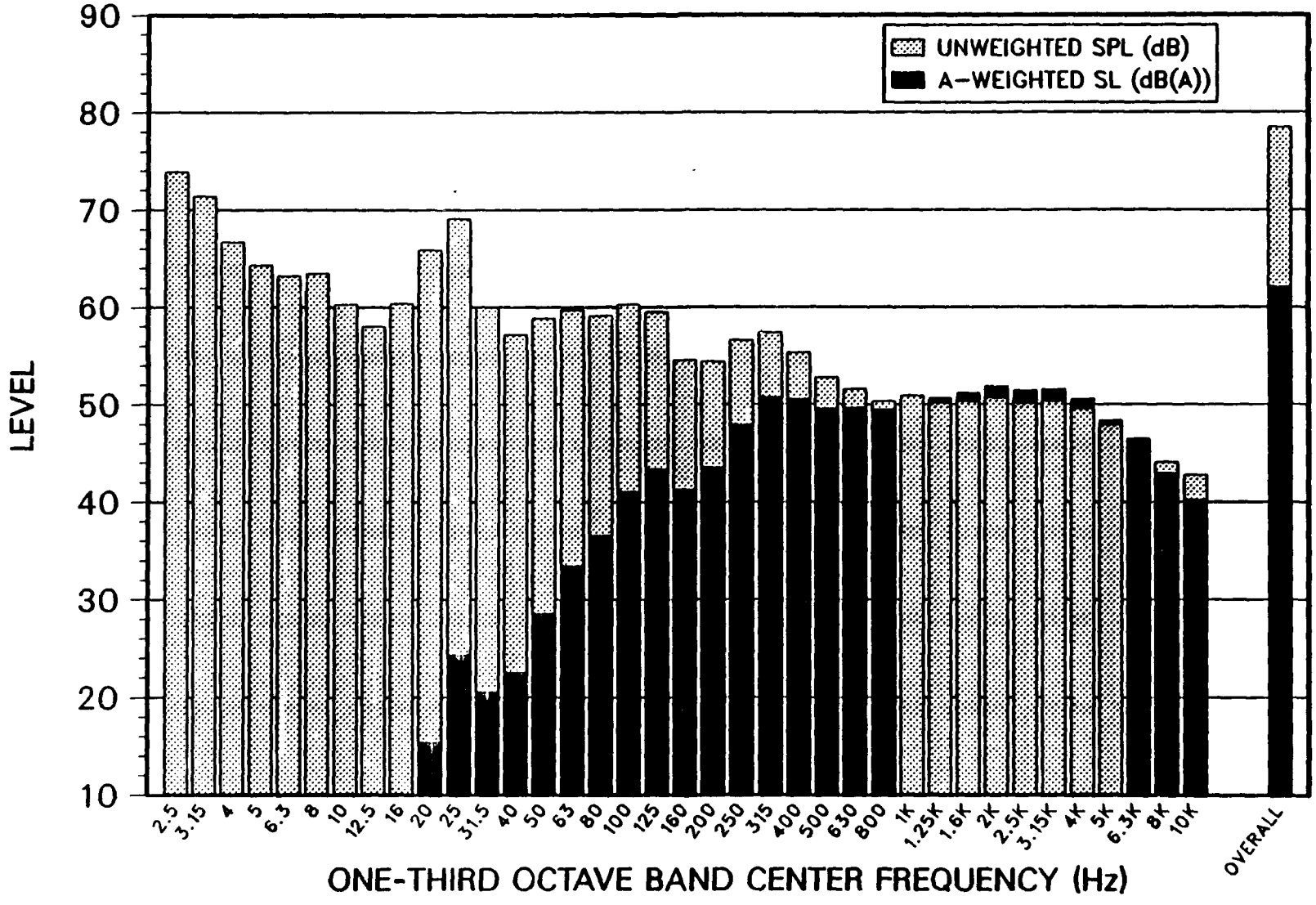
TITLE: HETF I\DCC\NEW MG OFF\ECS AC

FREQ (Hz)	SOUND PRESSURE LEVEL (dB)	OCTAVE BAND SPL (dB)	A-WEIGHTED SOUND LEVEL [dB(A)]	A-WEIGHTED OCTAVE BAND SL [dB(A)]
2.5	73.9		0	
3.15	71.4		0	
4	66.7	73	0	0
5	64.3		0	
6.3	63.2		0	
8	63.5	67.2	0	0
10	60.3		0	
12.5	58		0	
16	60.4	67.3	3.7	15.5
20	65.9		15.4	
25	69.1		24.4	
31.5	60	69.7	20.6	27.4
40	57.2		22.6	
50	58.9		28.6	
63	59.7	63.8	33.5	38.6
80	59.1		36.6	
100	60.3		41.1	
125	59.5	63.3	43.4	46.6
160	54.6		41.3	
200	54.4		43.6	
250	56.6	60.9	48	52.9
315	57.4		50.8	
400	55.4		50.6	
500	52.8	58.1	49.6	54.6
630	51.6		49.7	
800	50.3		49.5	
1,000	50.9	55.1	50.9	55
1,250	50.2		50.7	
1,600	50.3		51.2	
2,000	50.7	55	51.9	56.1
2,500	50.2		51.5	
3,150	50.4		51.6	
4,000	49.6	54	50.6	55
5,000	47.9		48.4	
6,300	46.5		46.3	
8,000	44.1	49.3	43	48.5
10,000	42.8		40.3	

*** OVERALL LEVELS (2.5 - 10,000 Hz) ***

OASPL = 78.5 dB OASLA = 62.2 dB(A)

TITLE: HETF I\DCC\NEW MG OFF\ECS AC



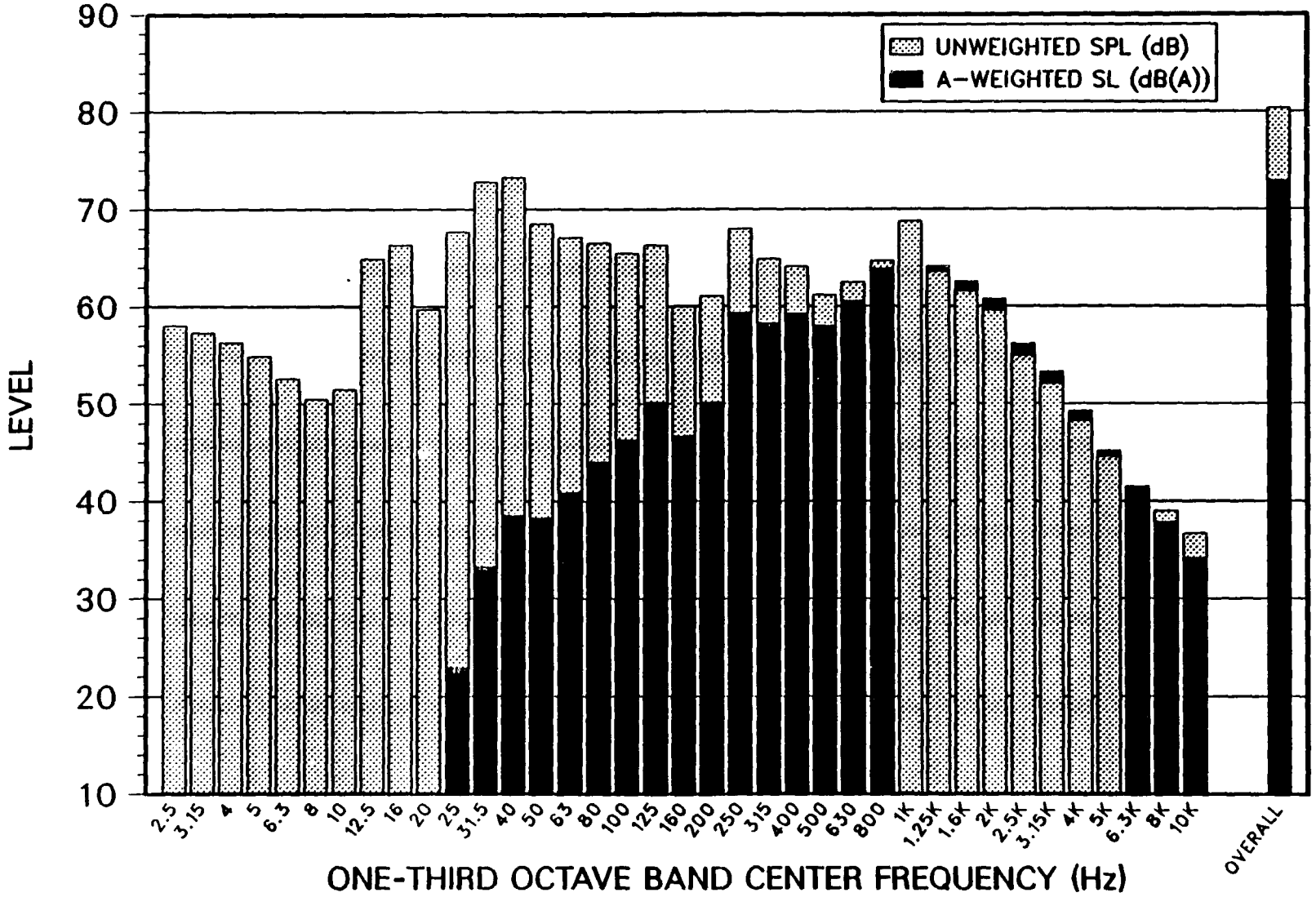
TITLE: HETF I\CC\NEW MG DC\ECS DC

FREQ (Hz)	SOUND PRESSURE LEVEL (dB)	OCTAVE BAND SPL (dB)	A-WEIGHTED SOUND LEVEL [dB(A)]	A-WEIGHTED OCTAVE BAND SL [dB(A)]
2.5	58		0	
3.15	57.3		0	
4	56.3	60.8	0	0
5	54.9		0	
6.3	52.6		0	
8	50.5	56.2	0	0
10	51.5		0	
12.5	64.9		1.6	
16	66.3	69	9.6	12.6
20	59.7		9.3	
25	67.7		23	
31.5	72.8	76.4	33.3	39.6
40	73.3		38.6	
50	68.5		38.3	
63	67.1	72	40.9	46.2
80	66.5		44	
100	65.5		46.3	
125	66.3	69.2	50.2	52.7
160	60		46.7	
200	61.1		50.2	
250	68	70.1	59.4	62
315	64.9		58.3	
400	64.1		59.3	
500	61.2	67.3	58	64
630	62.5		60.6	
800	64.7		63.9	
1,000	68.8	70.9	68.8	70.8
1,250	63.6		64.2	
1,600	61.6		62.6	
2,000	59.6	64.1	60.8	65.2
2,500	55		56.2	
3,150	52.1		53.3	
4,000	48.3	53.9	49.3	55
5,000	44.6		45.2	
6,300	41.5		41.4	
8,000	39	44.1	37.9	43.3
10,000	36.7		34.2	

••• OVERALL LEVELS (2.5 - 10,000 Hz) •••

OASPL = 80.4 dB OASLA = 73 dB(A)

TITLE: HETF I\CC\NEW MG DC\ECS DC

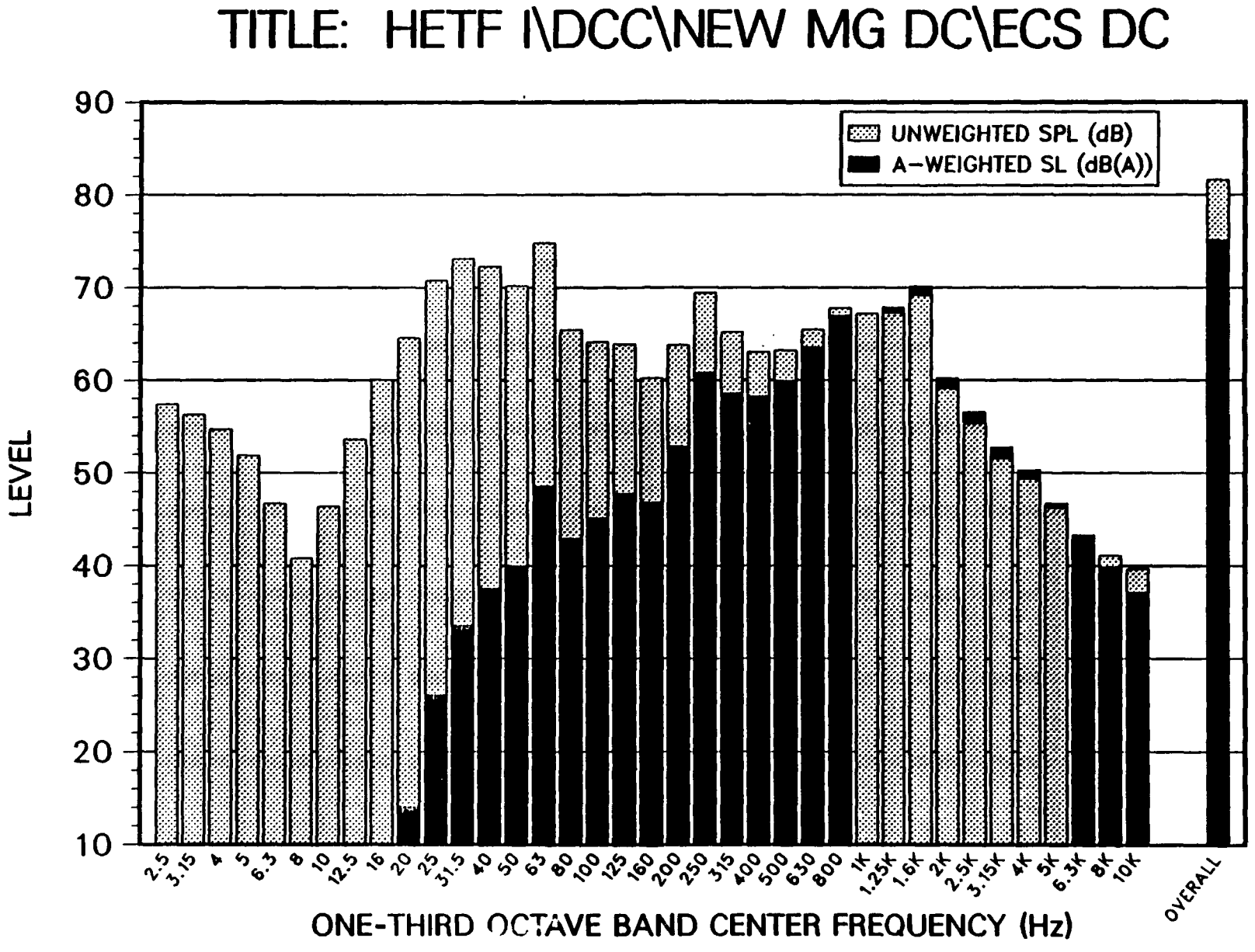


TITLE: HETF I\DCC\NEW MG DC\ECS DC

FREQ (Hz)	SOUND PRESSURE LEVEL (dB)	OCTAVE BAND SPL (dB)	A-WEIGHTED SOUND LEVEL [dB(A)]	A-WEIGHTED OCTAVE BAND SL [dB(A)]
2.5	57.4		0	
3.15	56.3		0	
4	54.7	59.2	0	0
5	51.9		0	
6.3	46.7		0	
8	40.8	49.9	0	0
10	46.4		0	
12.5	53.6		0	
16	60.1	66	3.4	14.3
20	64.6		14.1	
25	70.8		26.1	
31.5	73.1	76.7	33.6	39.1
40	72.3		37.6	
50	70.2		40	
63	74.8	76.3	48.6	49.9
80	65.4		42.9	
100	64.2		45.1	
125	63.9	67.7	47.8	51.3
160	60.2		46.9	
200	63.8		52.9	
250	69.4	71.4	60.8	63.1
315	65.2		58.6	
400	63.1		58.3	
500	63.2	68.7	60	65.8
630	65.5		63.6	
800	67.8		67	
1,000	67.2	72	67.2	71.9
1,250	67.3		67.9	
1,600	69.2		70.2	
2,000	59.1	69.6	60.3	70.6
2,500	55.4		56.6	
3,150	51.6		52.8	
4,000	49.4	54.2	50.3	55.2
5,000	46.2		46.7	
6,300	43.3		43.2	
8,000	41.1	46.1	39.9	45.3
10,000	39.6		37.1	

*** OVERALL LEVELS (2.5 - 10,000 Hz) ***

OASPL = 81.6 dB OASLA = 75.2 dB(A)


TITLE: HETF I\DCC\NEW MG DC\ECS DC
UNWEIGHTED SPL (dB)
A-WEIGHTED SL (dB(A))
LEVEL
90
80
70
60
50
40
30
20
10
2.5
3.15
4
5
6.3
8
10
12.5
16
20
25
31.5
40
50
63
80
100
125
160
200
250
315
400
500
630
800
1K
1.25K
1.6K
2K
2.5K
3.15K
4K
5K
6.3K
8K
10K
OVERALL
ONE-THIRD OCTAVE BAND CENTER FREQUENCY (Hz)

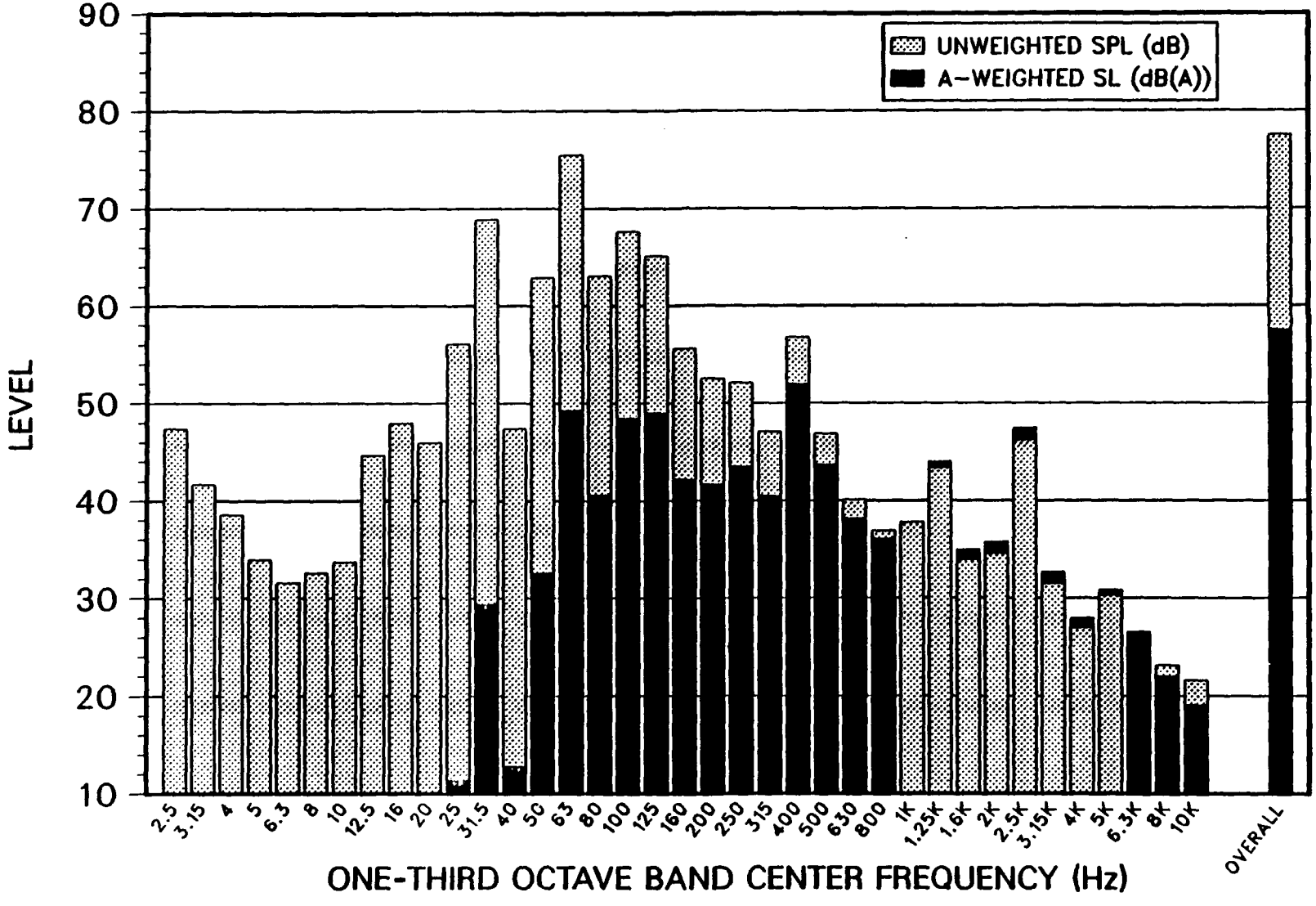
TITLE: HETF I\CC\NEW MG DC\ECS OFF

FREQ (Hz)	SOUND PRESSURE LEVEL (dB)	OCTAVE BAND SPL (dB)	A-WEIGHTED SOUND LEVEL [dB(A)]	A-WEIGHTED OCTAVE BAND SL [dB(A)]
2.5	47.4		0	
3.15	41.7		0	
4	38.6	43.7	0	0
5	34		0	
6.3	31.6		0	
8	32.6	37.3	0	0
10	33.7		0	
12.5	44.7		0	
16	48	51	0	0
20	46		0	
25	56.1		11.4	
31.5	68.9	68.9	29.4	29.4
40	47.4		12.8	
50	62.9		32.6	
63	75.5	75.8	49.3	49.8
80	63.1		40.6	
100	67.6		48.5	
125	65.1	69.5	49	52
160	55.6		42.2	
200	52.5		41.7	
250	52.1	55.8	43.5	46.6
315	47.1		40.5	
400	56.8		52	
500	46.9	57.1	43.7	52.6
630	40.1		38.2	
800	36.9		36.1	
1,000	37.8	45	37.8	45.2
1,250	43.4		44	
1,600	34		35	
2,000	34.6	46.5	35.8	47.8
2,500	46.2		47.5	
3,150	31.5		32.7	
4,000	27	34.6	28	35.5
5,000	30.3		30.9	
6,300	26.6		26.5	
8,000	23.1	28.9	22	28.2
10,000	21.6		19.1	

*** OVERALL LEVELS (2.5 - 10,000 Hz) ***

OASPL = 77.5 dB OASLA = 57.6 dB(A)

TITLE: HETF I\CC\NEW MG DC\ECS OFF



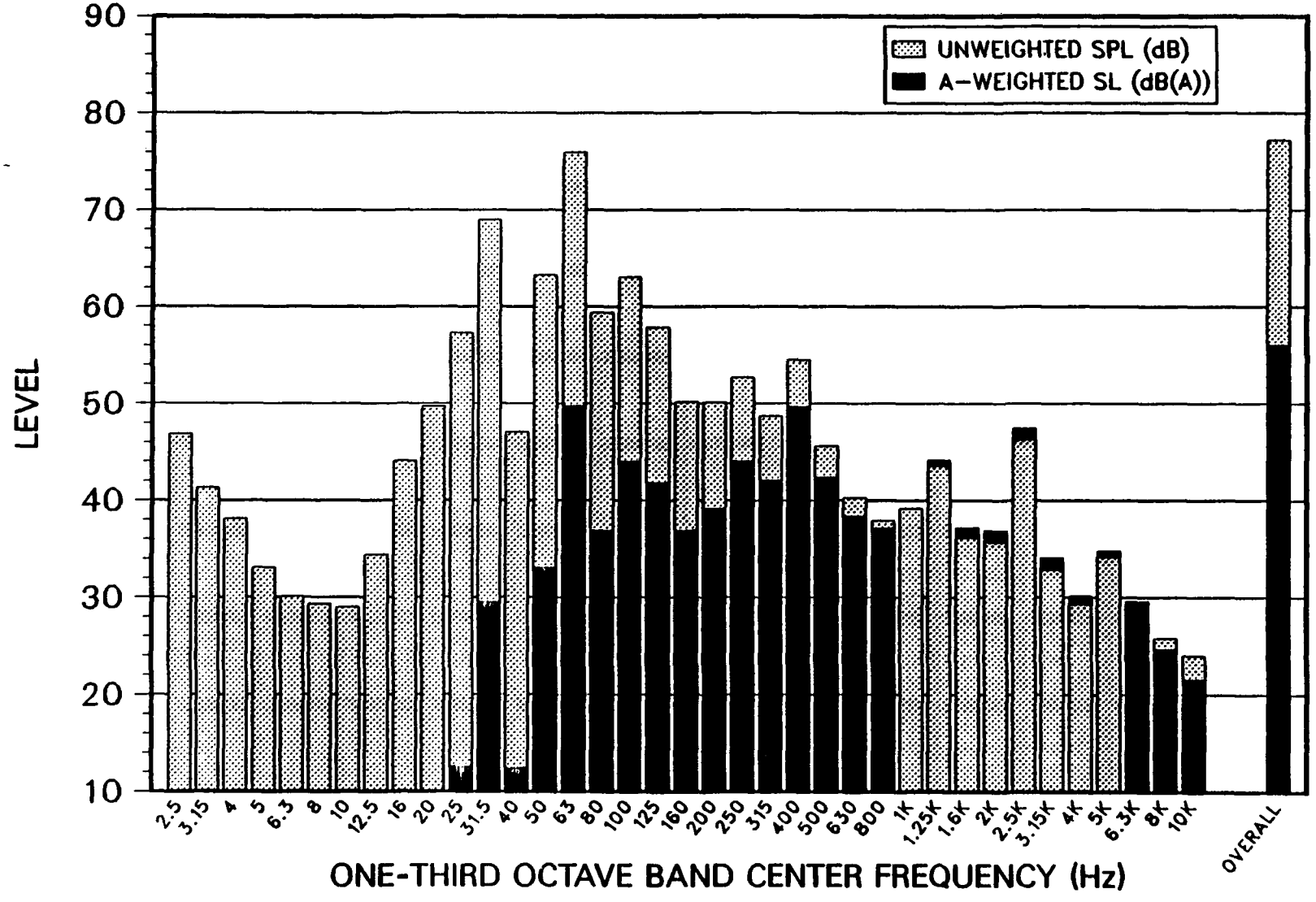
TITLE: HETF I\DCC\NEW MG DC\ECS OFF

FREQ (Hz)	SOUND PRESSURE LEVEL (dB)	OCTAVE BAND SPL (dB)	A-WEIGHTED SOUND LEVEL [dB(A)]	A-WEIGHTED OCTAVE BAND SL [dB(A)]
2.5	46.9		0	
3.15	41.3		0	
4	38.1	43.2	0	0
5	33.1		0	
6.3	30.1		0	
8	29.3	34.1	0	0
10	29		0	
12.5	34.4		0	
16	44.1	50.6	0	0
20	49.7		0	
25	57.3		12.6	
31.5	69	69.1	29.6	29.5
40	47.1		12.5	
50	63.3		33.1	
63	76	76.1	49.8	49.9
80	59.4		36.9	
100	63.1		44	
125	57.9	64.3	41.8	46.4
160	50.2		36.9	
200	50.1		39.2	
250	52.7	55.4	44	46.8
315	48.7		42.1	
400	54.5		49.7	
500	45.6	55	42.4	50.5
630	40.3		38.4	
800	37.9		37.1	
1,000	39.2	45.6	39.2	45.8
1,250	43.6		44.2	
1,600	36.2		37.2	
2,000	35.7	46.8	36.9	48.1
2,500	46.3		47.5	
3,150	32.9		34.1	
4,000	29.3	37.2	30.2	38
5,000	34.2		34.8	
6,300	29.6		29.5	
8,000	25.8	31.7	24.7	31
10,000	24		21.6	

*** OVERALL LEVELS (2.5 - 10,000 Hz) ***

OASPL = 77.2 dB OASLA = 56.1 dB(A)

TITLE: HETF I\DCC\NEW MG DC\ECS OFF

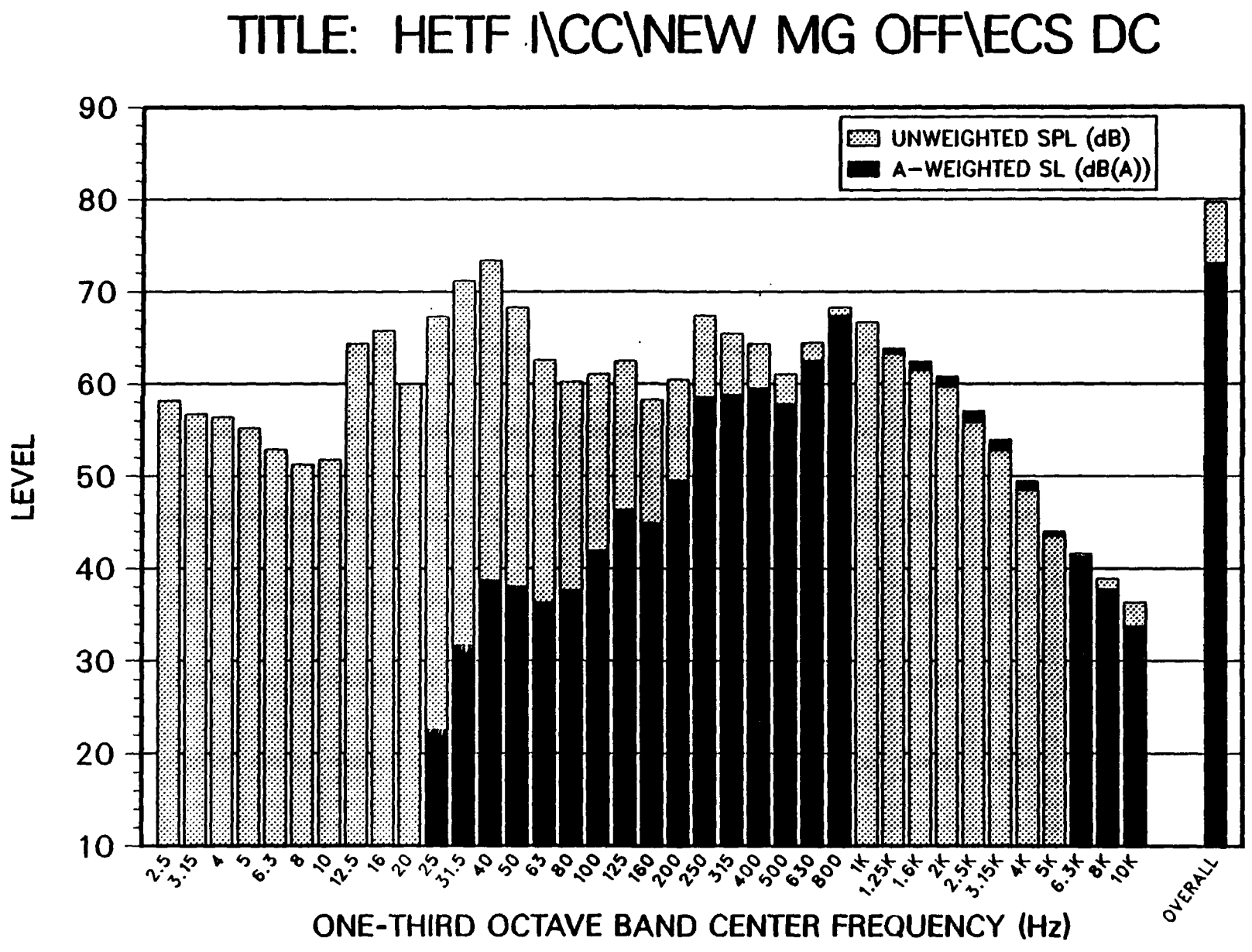


TITLE: HETF I\CC\NEW MG OFF\ECS DC

FREQ (Hz)	SOUND PRESSURE LEVEL (dB)	OCTAVE BAND SPL (dB)	A-WEIGHTED SOUND LEVEL [dB(A)]	A-WEIGHTED OCTAVE BAND SL [dB(A)]
2.5	58.2		0	
3.15	56.7		0	
4	56.4	60.7	0	0
5	55.2		0	
6.3	52.9		0	
8	51.3	56.6	0	0
10	51.8		0	
12.5	64.4		1	
16	65.8	68.6	9.1	12.5
20	60		9.5	
25	67.3		22.6	
31.5	71.2	75.9	31.7	39.4
40	73.4		38.8	
50	68.3		38.1	
63	62.6	69.7	36.4	42
80	60.2		37.7	
100	61.1		42	
125	62.5	65.6	46.4	49.4
160	58.3		45	
200	60.5		49.6	
250	67.4	69.9	58.7	61.9
315	65.5		58.9	
400	64.4		59.6	
500	61.1	68.2	57.9	65
630	64.5		62.6	
800	68.3		67.5	
1,000	66.7	71.1	66.7	70.9
1,250	63.3		63.9	
1,600	61.5		62.5	
2,000	59.7	64.2	60.9	65.3
2,500	55.8		57.1	
3,150	52.8		54	
4,000	48.5	54.3	49.5	55.4
5,000	43.5		44	
6,300	41.6		41.4	
8,000	38.9	44	37.8	43.3
10,000	36.3		33.8	

*** OVERALL LEVELS (2.5 - 10,000 Hz) ***

OASPL = 79.7 dB OASLA = 73.2 dB(A)


TITLE: HETF I\CC\NEW MG OFF\ECS DC
UNWEIGHTED SPL (dB)
A-WEIGHTED SL (dB(A))
LEVEL
90
80
70
60
50
40
30
20
10
2.5
3.15
4
5
6.3
8
10
12.5
16
20
25
31.5
40
50
63
80
100
125
160
200
250
315
400
500
630
800
1K
1.25K
1.6K
2K
2.5K
3.15K
4K
5K
6.3K
8K
10K
OVERALL
ONE-THIRD OCTAVE BAND CENTER FREQUENCY (Hz)

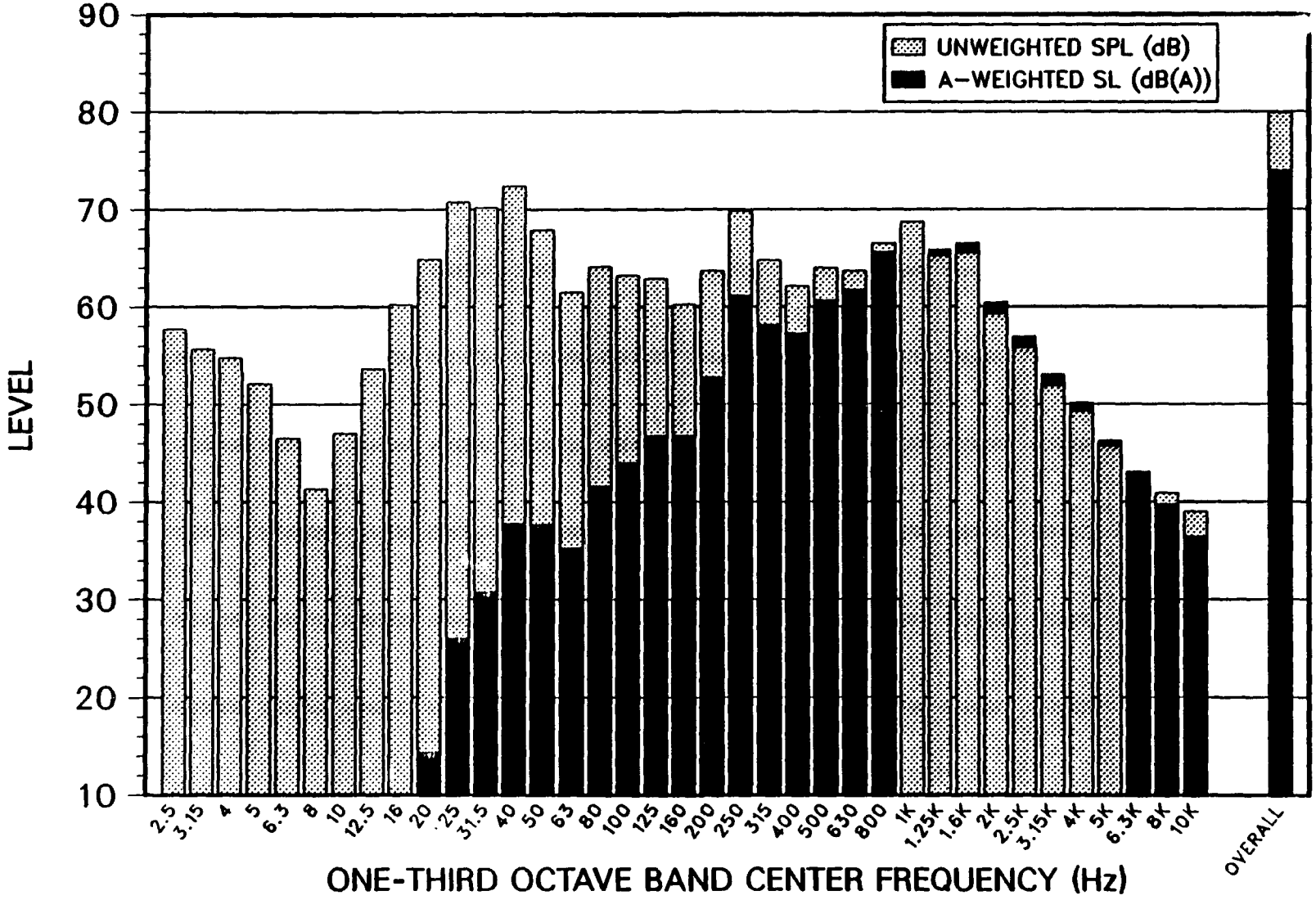
TITLE: HETF I\DCC\NEW MG OFF\ECS DC

FREQ (Hz)	SOUND PRESSURE LEVEL (dB)	OCTAVE BAND SPL (dB)	A-WEIGHTED SOUND LEVEL [dB(A)]	A-WEIGHTED OCTAVE BAND SL [dB(A)]
2.5	57.7		0	
3.15	55.7		0	
4	54.8	59	0	0
5	52.1		0	
6.3	46.5		0	
8	41.3	50.2	0	0
10	47		0	
12.5	53.6		0	
16	60.2	66.2	3.5	14.6
20	64.9		14.4	
25	70.8		26.1	
31.5	70.2	75.8	30.8	38.6
40	72.4		37.8	
50	67.9		37.7	
63	61.5	69.9	35.3	43.6
80	64.1		41.6	
100	63.2		44	
125	62.9	66.8	46.8	50.6
160	60.2		46.8	
200	63.7		52.8	
250	69.8	71.5	61.2	63.2
315	64.8		58.2	
400	62.1		57.3	
500	64	67.9	60.7	64.9
630	63.7		61.8	
800	66.5		65.7	
1,000	68.7	71.6	68.7	71.5
1,250	65.3		65.9	
1,600	65.6		66.6	
2,000	59.3	66.7	60.5	67.7
2,500	55.8		57	
3,150	51.9		53.1	
4,000	49.3	54.2	50.2	55.3
5,000	45.7		46.3	
6,300	43.1		43	
8,000	40.9	45.9	39.8	45.1
10,000	39		36.5	

••• OVERALL LEVELS (2.5 - 10,000 Hz) •••

OASPL = 79.9 dB OASLA = 74.1 dB(A)

TITLE: HETF I\DCC\NEW MG OFF\ECS DC



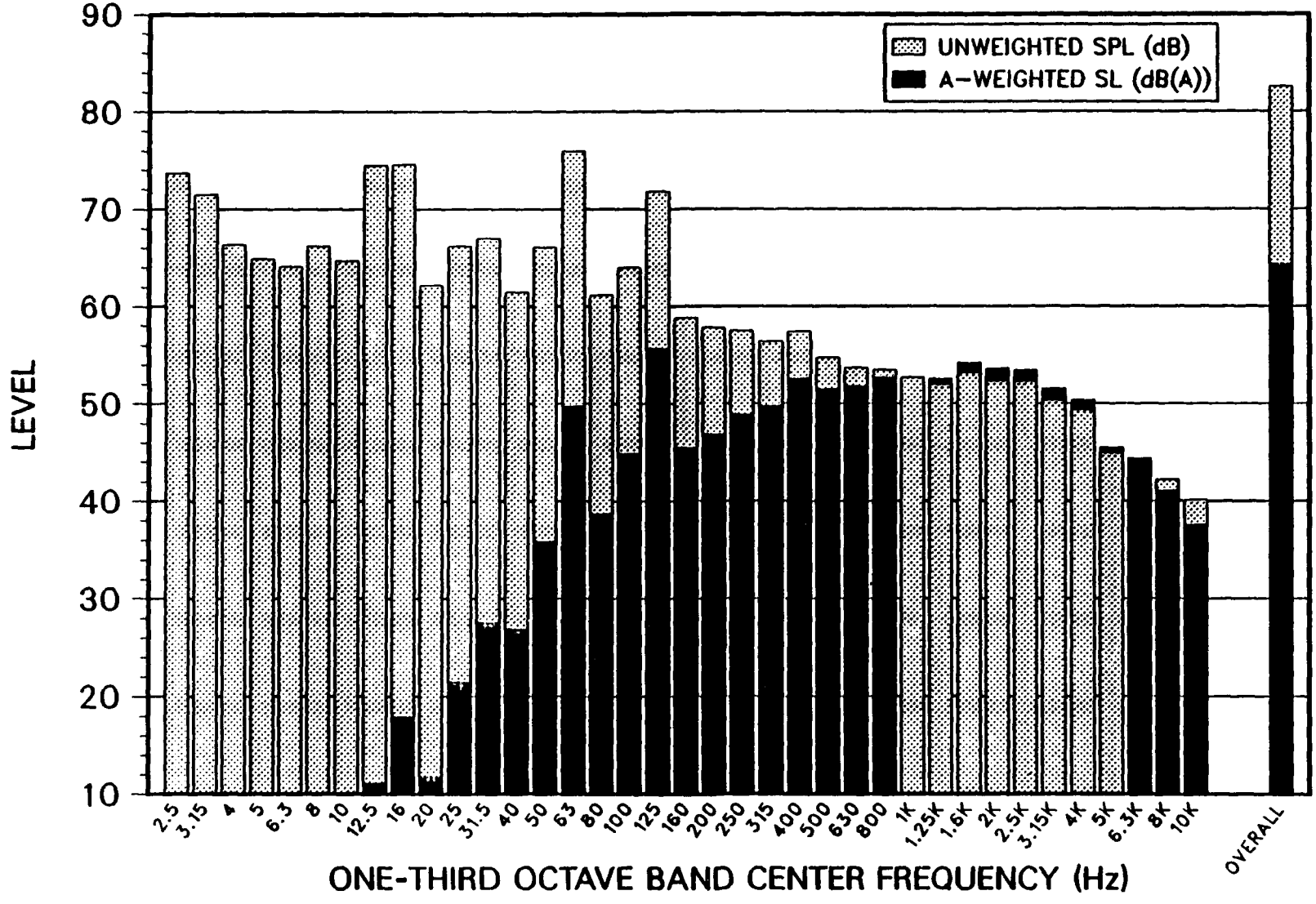
TITLE: HETF I\CC\NEW MG W/PM AC\ECS AC

FREQ (Hz)	SOUND PRESSURE LEVEL (dB)	OCTAVE BAND SPL (dB)	A-WEIGHTED SOUND LEVEL [dB(A)]	A-WEIGHTED OCTAVE BAND SL [dB(A)]
2.5	73.7		0	
3.15	71.5		0	
4	66.4	73.1	0	0
5	64.9		0	
6.3	64.1		0	
8	66.2	69.6	0	0
10	64.7		0	
12.5	74.5		11.1	
16	74.6	77.5	17.9	19.3
20	62.2		11.8	
25	66.2		21.5	
31.5	67	70.1	27.6	30.6
40	61.5		26.9	
50	66.1		35.9	
63	76	76.3	49.8	50.1
80	61.2		38.7	
100	64		44.9	
125	71.8	72.5	55.7	56.3
160	58.8		45.5	
200	57.8		46.9	
250	57.5	61.8	48.9	53.2
315	56.4		49.8	
400	57.4		52.6	
500	54.7	60.1	51.5	56.6
630	53.7		51.8	
800	53.5		52.7	
1,000	52.7	57.4	52.7	57.2
1,250	52		52.6	
1,600	53.2		54.2	
2,000	52.4	57.2	53.6	58.4
2,500	52.3		53.5	
3,150	50.4		51.6	
4,000	49.4	53.4	50.4	54.4
5,000	45		45.5	
6,300	44.4		44.3	
8,000	42.2	47.2	41.1	46.4
10,000	40.1		37.6	

••• OVERALL LEVELS (2.5 - 10,000 Hz) •••

OASPL = 82.6 dB OASLA = 64.4 dB(A)

TITLE: HETF I\CC\NEW MG W/PM AC\ECS AC

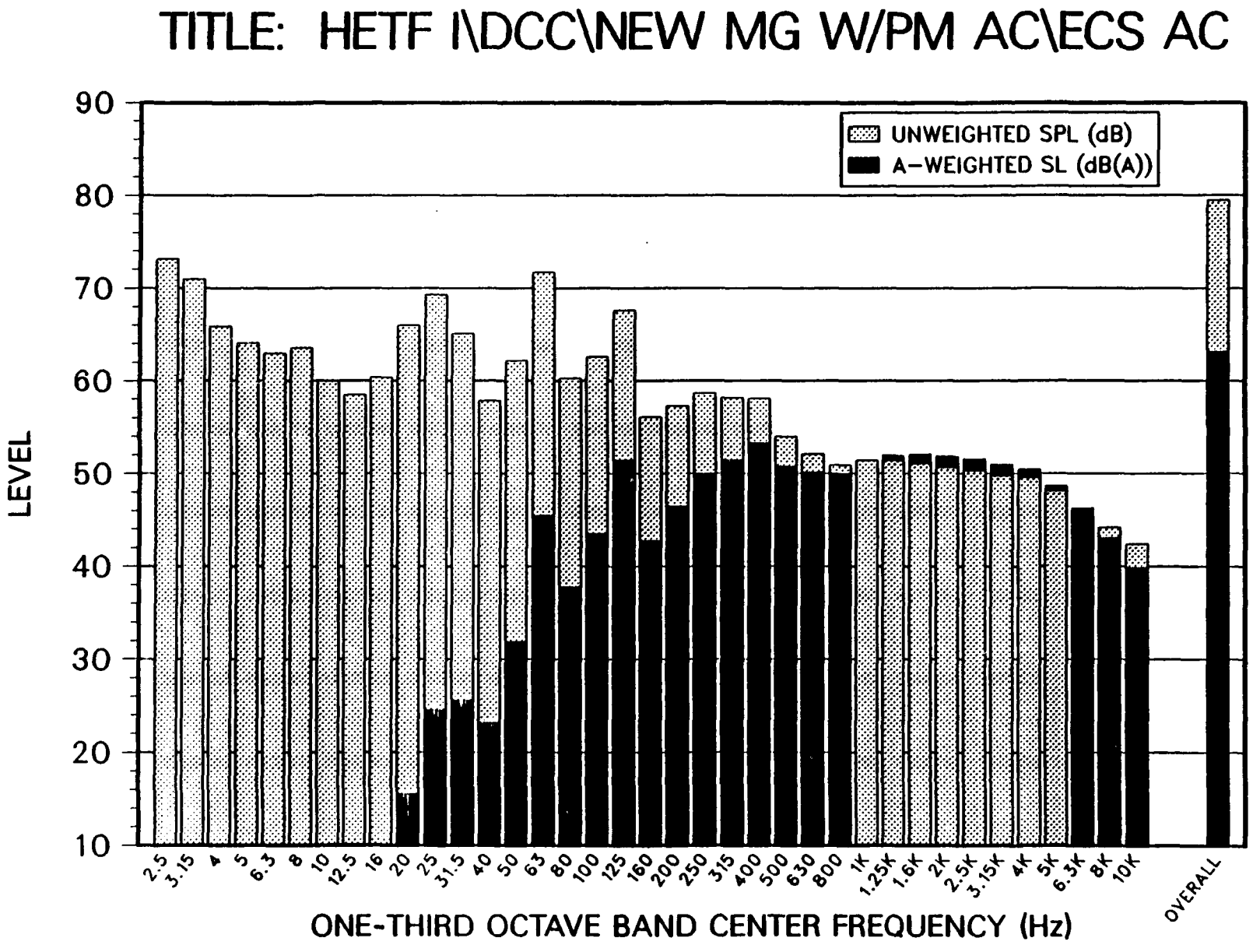


TITLE: HETF I\DCC\NEW MG W/PM AC\ECS AC

FREQ (Hz)	SOUND PRESSURE LEVEL (dB)	OCTAVE BAND SPL (dB)	A-WEIGHTED SOUND LEVEL [dB(A)]	A-WEIGHTED OCTAVE BAND SL [dB(A)]
2.5	73.2		0	
3.15	71		0	
4	65.9	72.6	0	0
5	64.1		0	
6.3	63		0	
8	63.6	67	0	0
10	60		0	
12.5	58.5		0	
16	60.4	67.5	3.7	15.7
20	66		15.6	
25	69.3		24.6	
31.5	65.1	70.7	25.6	29.2
40	57.9		23.2	
50	62.2		31.9	
63	71.7	72.2	45.5	46.1
80	60.3		37.8	
100	62.6		43.5	
125	67.6	68.8	51.5	52.4
160	56.1		42.8	
200	57.3		46.5	
250	58.7	62.7	50	54.4
315	58.2		51.5	
400	58.1		53.3	
500	54	60.1	50.8	56.2
630	52.1		50.2	
800	50.9		50	
1,000	51.4	55.8	51.4	55.8
1,250	51.4		52	
1,600	51.1		52.1	
2,000	50.7	55.3	51.9	56.4
2,500	50.3		51.6	
3,150	49.8		51	
4,000	49.6	53.8	50.5	54.7
5,000	48.1		48.7	
6,300	46.3		46.2	
8,000	44.2	49.2	43.1	48.4
10,000	42.4		39.9	

••• OVERALL LEVELS (2.5 - 10,000 Hz) •••

OASPL = 79.5 dB OASLA = 63.2 dB(A)

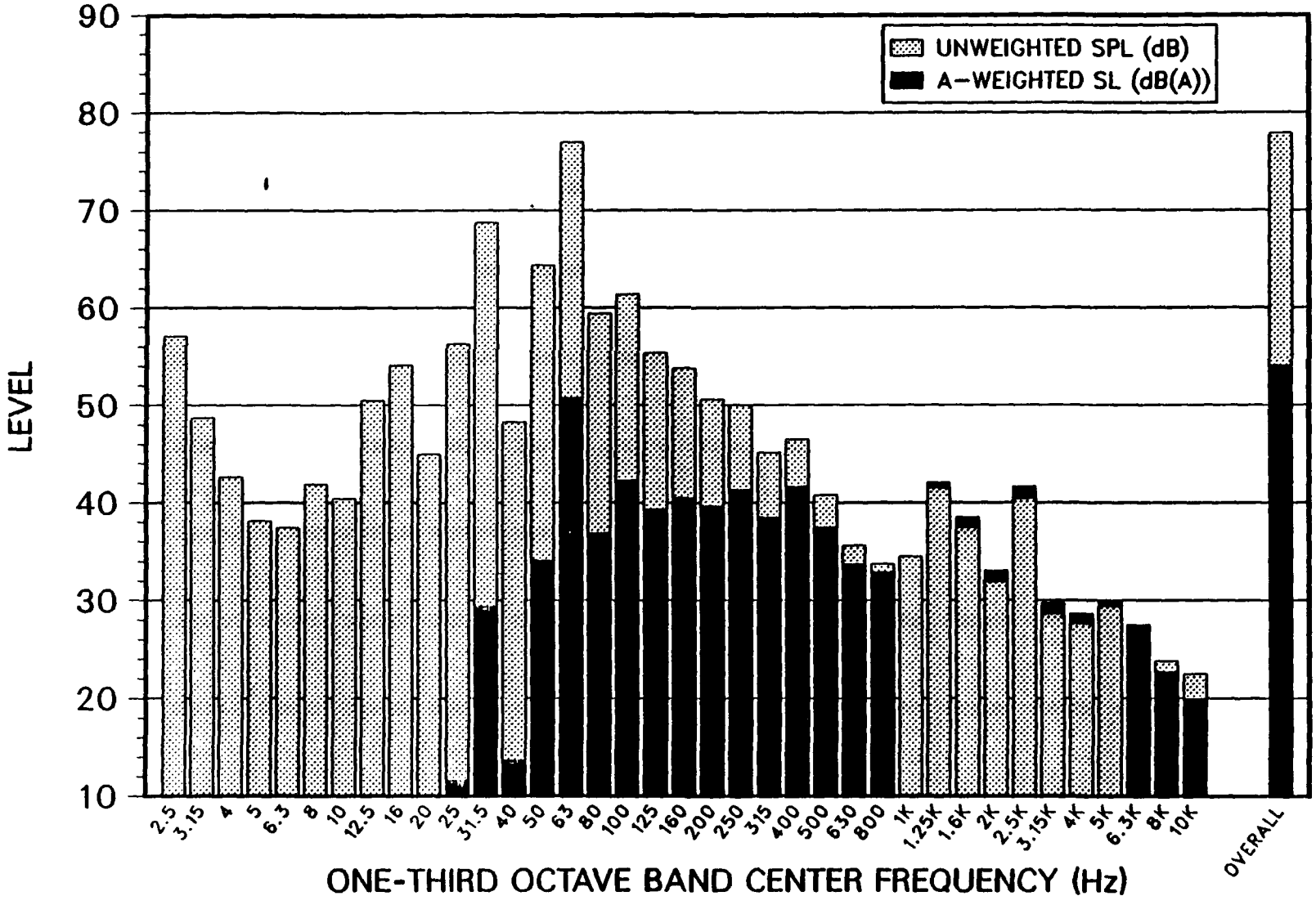

TITLE: HETF I\DCC\NEW MG W/PM AC\ECS AC
UNWEIGHTED SPL (dB)
A-WEIGHTED SL (dB(A))
LEVEL
90
80
70
60
50
40
30
20
10
2.5
3.15
4
5
6.3
8
10
12.5
16
20
25
31.5
40
50
63
80
100
125
160
200
250
315
400
500
630
800
1K
1.25K
1.6K
2K
2.5K
3.15K
4K
5K
6.3K
8K
10K
OVERALL
ONE-THIRD OCTAVE BAND CENTER FREQUENCY (Hz)

TITLE: HETF I\CC\NEW MG W/PM AC\ECS OFF

FREQ (Hz)	SOUND PRESSURE LEVEL (dB)	OCTAVE BAND SPL (dB)	A-WEIGHTED SOUND LEVEL [dB(A)]	A-WEIGHTED OCTAVE BAND SL [dB(A)]
2.5	57.1		0	
3.15	48.7		0	
4	42.6	49.7	0	0
5	38.1		0	
6.3	37.4		0	
8	41.9	44.8	0	0
10	40.4		0	
12.5	50.5		0	
16	54.1	55.8	0	0
20	45		0	
25	56.3		11.6	
31.5	68.8	68.9	29.4	29.3
40	48.3		13.7	
50	64.4		34.1	
63	77	77.1	50.8	50.9
80	59.4		36.9	
100	61.4		42.3	
125	55.4	62.8	39.3	45.4
160	53.8		40.5	
200	50.6		39.7	
250	50	53.8	41.4	44.6
315	45.1		38.5	
400	46.5		41.7	
500	40.8	47.6	37.5	43.4
630	35.6		33.7	
800	33.7		32.9	
1,000	34.5	42.7	34.5	43.1
1,250	41.5		42.1	
1,600	37.5		38.5	
2,000	31.9	42.4	33.1	43.6
2,500	40.4		41.7	
3,150	28.6		29.8	
4,000	27.7	33.2	28.7	34.1
5,000	29.4		29.9	
6,300	27.5		27.4	
8,000	23.8	29.7	22.7	29
10,000	22.5		20	

*** OVERALL LEVELS (2.5 - 10,000 Hz) ***

OASPL = 77.9 dB OASLA = 54.1 dB(A)


TITLE: HETF I\CC\NEW MG W/PM AC\ECS OFF
UNWEIGHTED SPL (dB)
A-WEIGHTED SL (dB(A))
LEVEL
90
80
70
60
50
40
30
20
10
2.5
3.15
4
5
6.3
8
10
12.5
16
20
25
31.5
40
50
63
80
100
125
160
200
250
315
400
500
630
800
1K
1.25K
1.6K
2K
2.5K
3.15K
4K
5K
6.3K
8K
10K
OVERALL
ONE-THIRD OCTAVE BAND CENTER FREQUENCY (Hz)

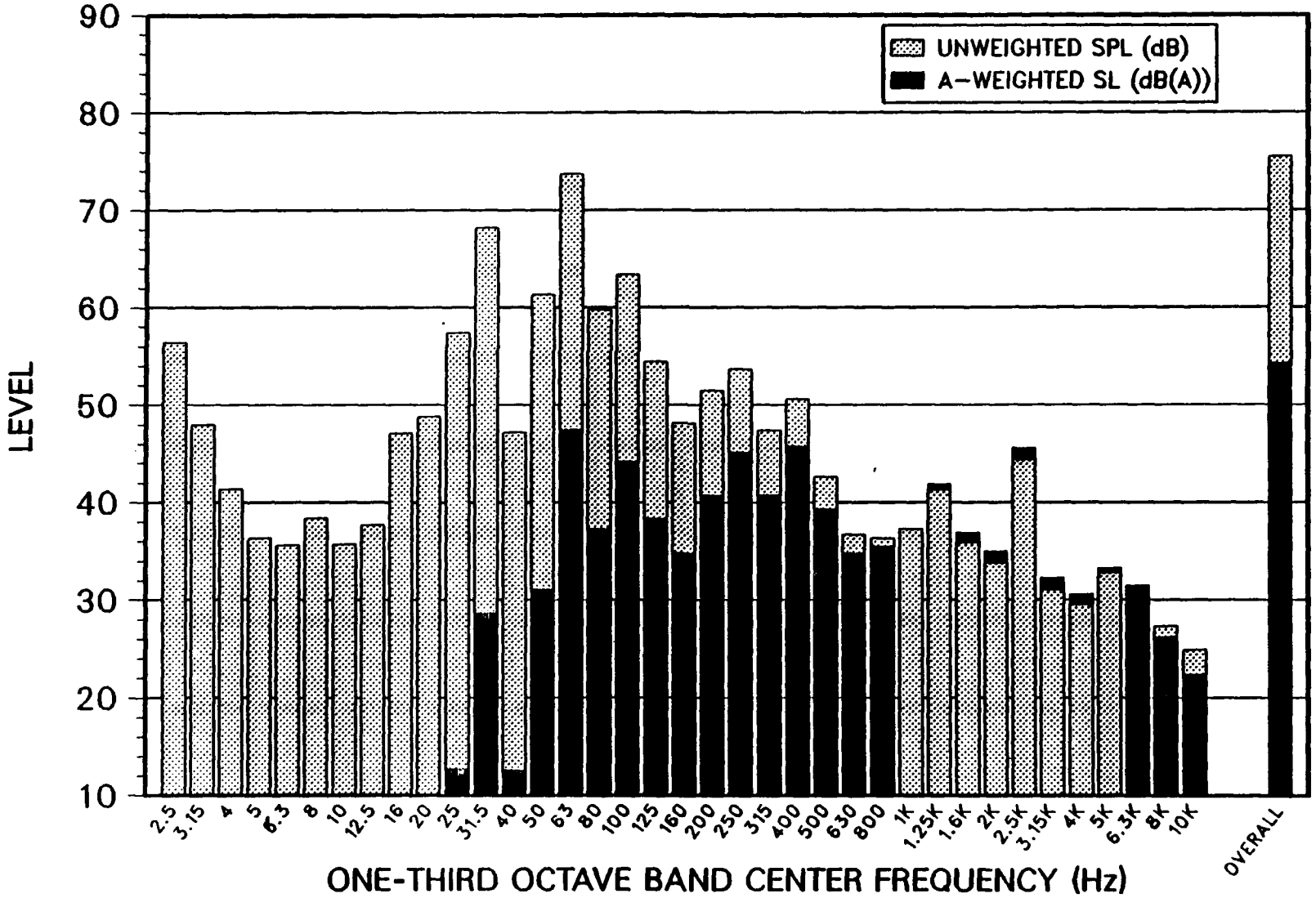
TITLE: HETF I\DCC\NEW MG AC\PM\ECS OFF

FREQ (Hz)	SOUND PRESSURE LEVEL (dB)	OCTAVE BAND SPL (dB)	A-WEIGHTED SOUND LEVEL [dB(A)]	A-WEIGHTED OCTAVE BAND SL [dB(A)]
2.5	56.4		0	
3.15	48		0	
4	41.4	48.9	0	0
5	36.3		0	
6.3	35.6		0	
8	38.4	41.3	0	0
10	35.7		0	
12.5	37.7		0	
16	47.1	51.1	0	0
20	48.8		0	
25	57.4		12.7	
31.5	68.2	68.4	28.7	28.7
40	47.2		12.6	
50	61.3		31.1	
63	73.7	74	47.5	47.8
80	59.8		37.3	
100	63.4		44.2	
125	54.4	63.8	38.3	45.4
160	48.1		34.8	
200	51.5		40.7	
250	53.7	56.1	45.1	47.3
315	47.4		40.8	
400	50.6		45.8	
500	42.6	51.2	39.3	46.8
630	36.7		34.8	
800	36.3		35.5	
1,000	37.3	43.4	37.3	43.7
1,250	41.3		41.9	
1,600	35.9		36.9	
2,000	33.8	45.1	35	46.3
2,500	44.4		45.6	
3,150	31.1		32.3	
4,000	29.6	35.9	30.6	36.8
5,000	32.8		33.3	
6,300	31.5		31.4	
8,000	27.3	33.4	26.2	32.8
10,000	24.9		22.4	

*** OVERALL LEVELS (2.5 - 10,000 Hz) ***

OASPL = 75.5 dB OASLA = 54.3 dB(A)

TITLE: HETF I\DCC\NEW MG AC\PM\ECS OFF

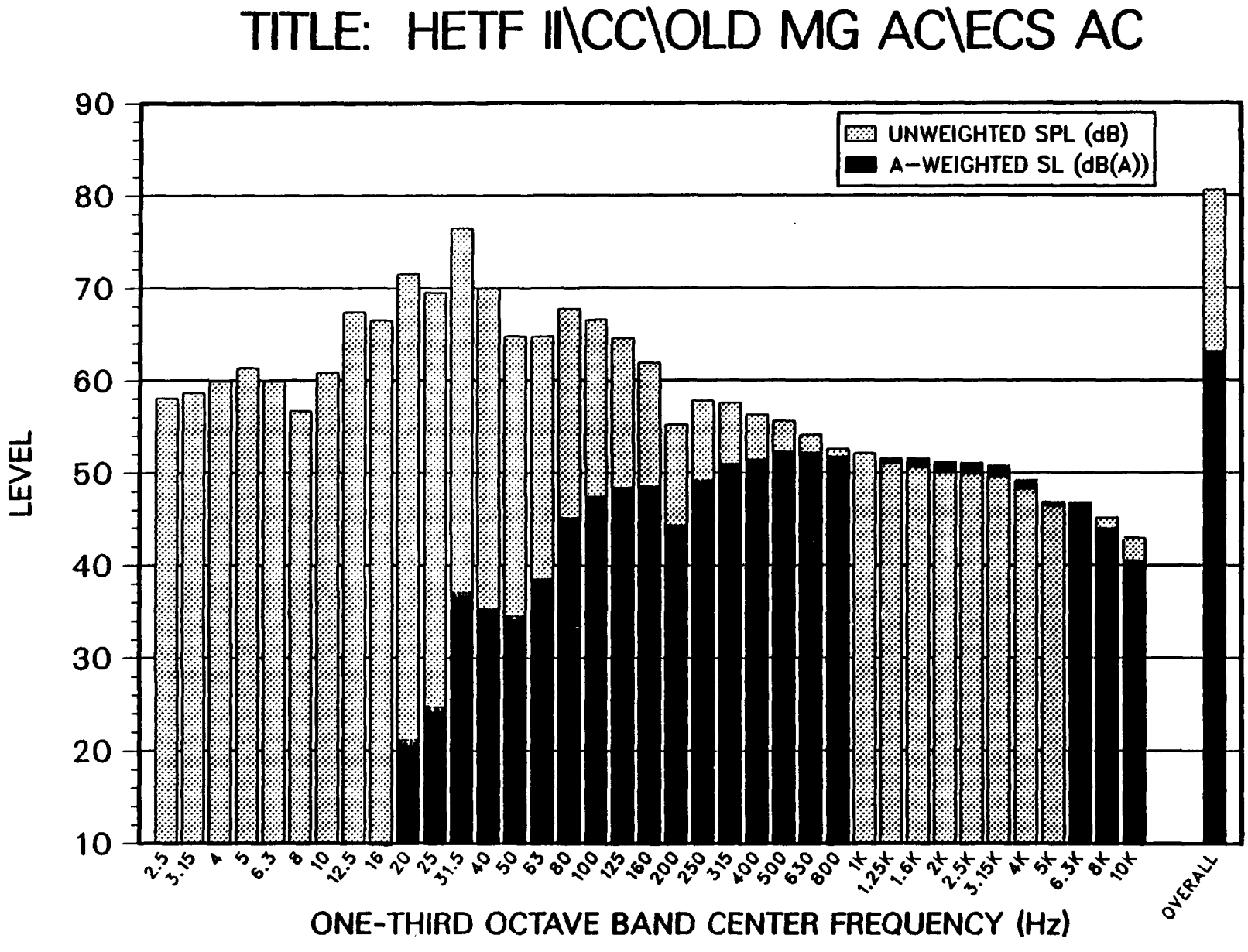


TITLE: HETF II\CC\OLD MG AC\ECS AC

FREQ (Hz)	SOUND PRESSURE LEVEL (dB)	OCTAVE BAND SPL (dB)	A-WEIGHTED SOUND LEVEL [dB(A)]	A-WEIGHTED OCTAVE BAND SL [dB(A)]
2.5	58.1		0	
3.15	58.7		0	
4	59.9	64.7	0	0
5	61.4		0	
6.3	59.9		0	
8	56.7	64.1	0	0
10	60.9		0	
12.5	67.4		4.1	
16	66.5	73.7	9.8	21.4
20	71.6		21.2	
25	69.5		24.8	
31.5	76.5	77.9	37.1	39.3
40	70		35.4	
50	64.8		34.6	
63	64.8	70.6	38.6	46.2
80	67.8		45.2	
100	66.6		47.5	
125	64.6	69.4	48.5	52.8
160	61.9		48.6	
200	55.2		44.4	
250	57.8	61.6	49.2	53.5
315	57.6		51	
400	56.3		51.5	
500	55.6	60	52.4	56.6
630	54.1		52.2	
800	52.6		51.8	
1,000	52.1	56.5	52.1	56.4
1,250	51		51.6	
1,600	50.6		51.6	
2,000	50	54.8	51.2	55.9
2,500	49.9		51.1	
3,150	49.6		50.8	
4,000	48.3	52.9	49.2	53.9
5,000	46.4		46.9	
6,300	46.8		46.7	
8,000	45.1	49.8	44	49
10,000	42.9		40.5	

*** OVERALL LEVELS (2.5 - 10,000 Hz) ***

OASPL = 80.6 dB OASLA = 63.2 dB(A)

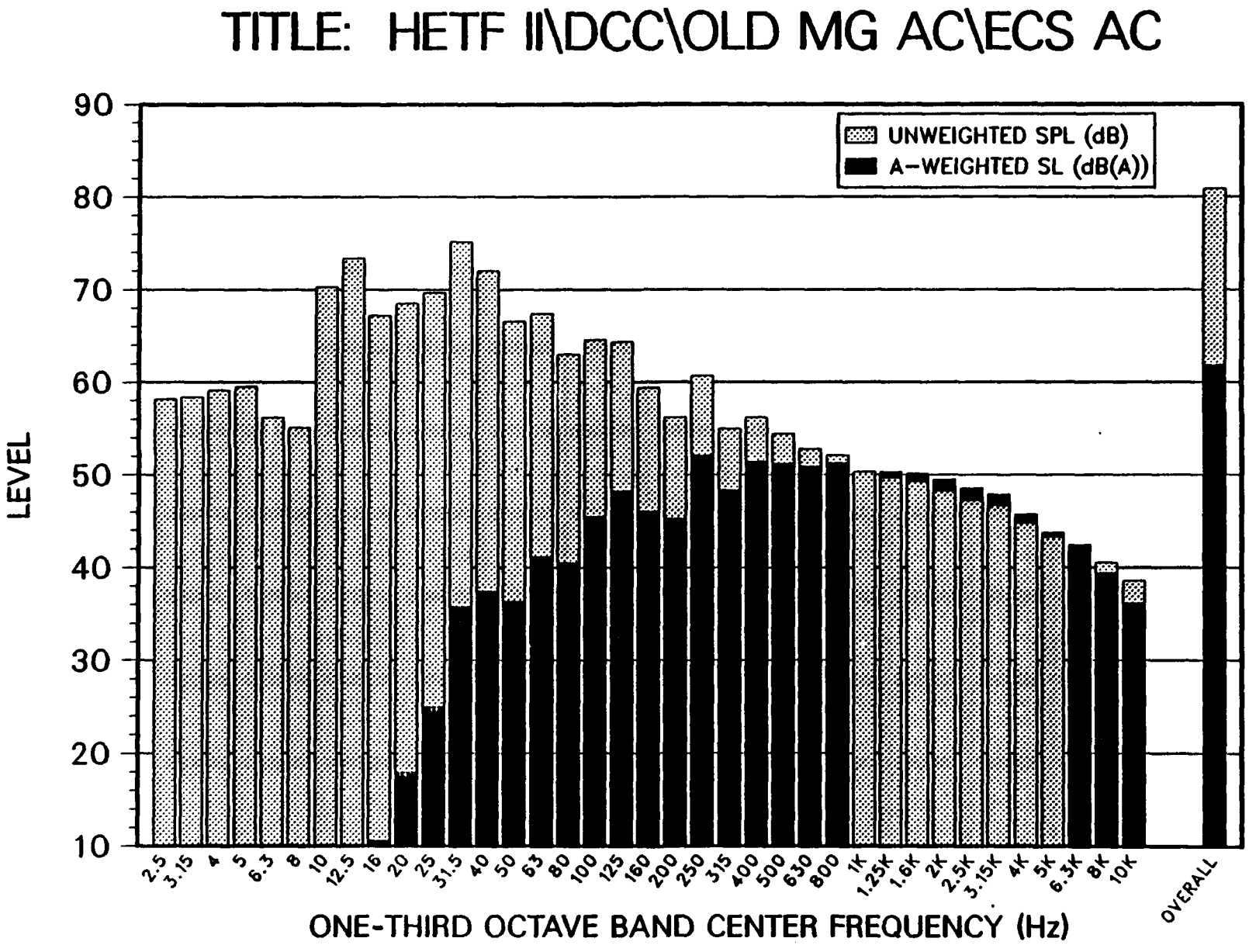

TITLE: HETF II\CC\OLD MG AC\ECS AC
UNWEIGHTED SPL (dB)
A-WEIGHTED SL (dB(A))
LEVEL
90
80
70
60
50
40
30
20
10
2.5
3.15
4
5
6.3
8
10
12.5
16
20
25
31.5
40
50
63
80
100
125
160
200
250
315
400
500
630
800
1K
1.25K
1.6K
2K
2.5K
3.15K
4K
5K
6.3K
8K
10K
OVERALL
ONE-THIRD OCTAVE BAND CENTER FREQUENCY (Hz)

TITLE: HETF II\DCC\OLD MG AC\ECS AC

FREQ (Hz)	SOUND PRESSURE LEVEL (dB)	OCTAVE BAND SPL (dB)	A-WEIGHTED SOUND LEVEL [dB(A)]	A-WEIGHTED OCTAVE BAND SL [dB(A)]
2.5	58.2		0	
3.15	58.4		0	
4	59.1	63.6	0	0
5	59.5		0	
6.3	56.2		0	
8	55.1	70.4	0	0
10	70.3		0	
12.5	73.4		10	
16	67.2	75.1	10.6	19.1
20	68.5		18	
25	69.7		25	
31.5	75.2	77.5	35.8	39.6
40	72		37.4	
50	66.6		36.4	
63	67.4	70.7	41.2	44.4
80	63		40.5	
100	64.6		45.5	
125	64.4	68	48.3	51.4
160	59.4		46.1	
200	56.2		45.3	
250	60.7	62.6	52.1	54
315	55		48.4	
400	56.2		51.4	
500	54.4	59.3	51.2	55.7
630	52.8		50.9	
800	52.1		51.3	
1,000	50.3	55.4	50.3	55.2
1,250	49.7		50.3	
1,600	49.3		50.2	
2,000	48.3	52.9	49.5	54.1
2,500	47.3		48.6	
3,150	46.7		47.9	
4,000	44.8	49.7	45.8	50.7
5,000	43.3		43.8	
6,300	42.5		42.4	
8,000	40.5	45.4	39.4	44.6
10,000	38.6		36.2	

*** OVERALL LEVELS (2.5 - 10,000 Hz) ***

OASPL = 80.9 dB OASLA = 61.9 dB(A)

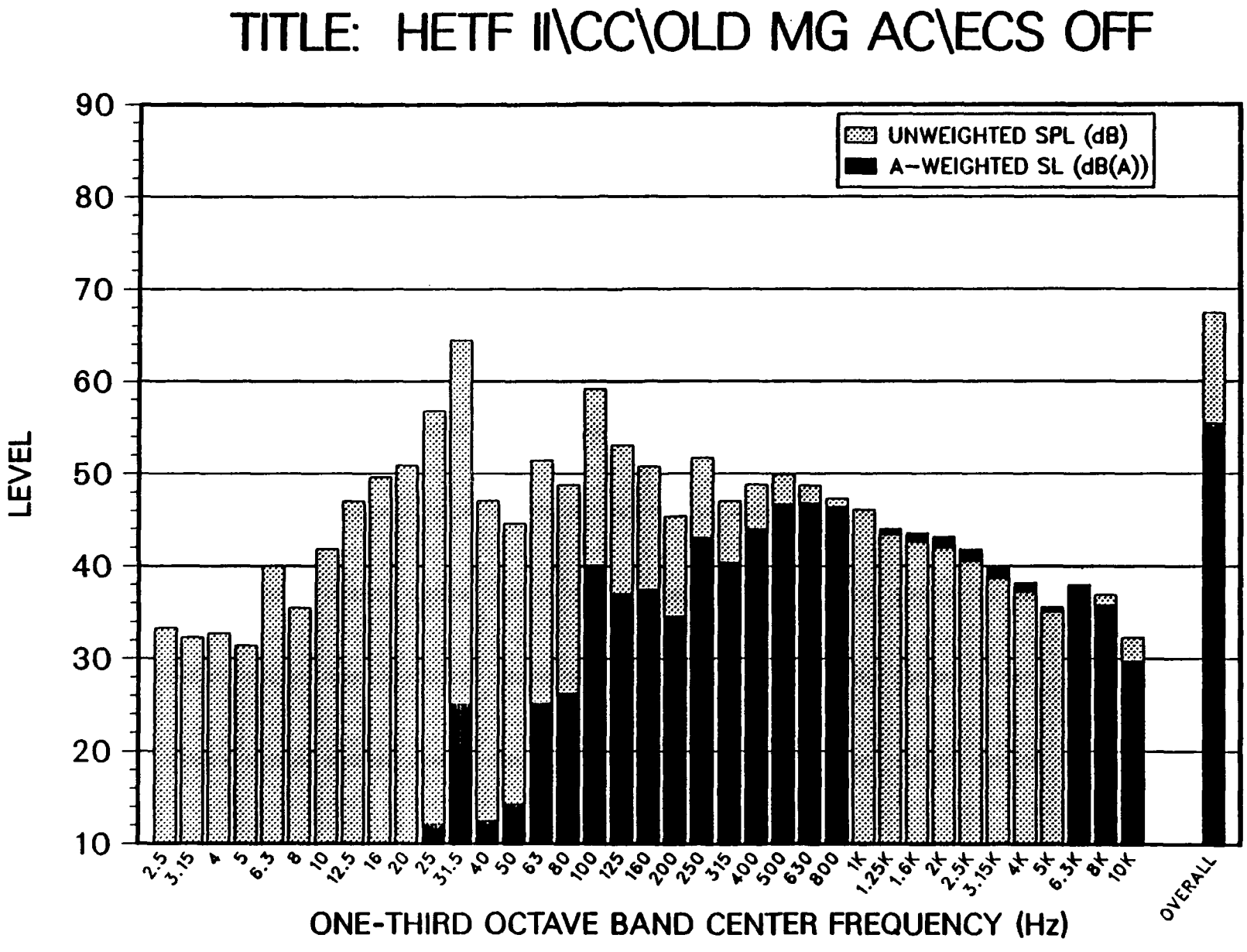

TITLE: HETF II\DCC\OLD MG AC\ECS AC
UNWEIGHTED SPL (dB)
A-WEIGHTED SL (dB(A))
LEVEL
90
80
70
60
50
40
30
20
10
2.5
3.15
4
5
6.3
8
10
12.5
16
20
25
31.5
40
50
63
80
100
125
160
200
250
315
400
500
630
800
1K
1.25K
1.6K
2K
2.5K
3.15K
4K
5K
6.3K
8K
10K
OVERALL
ONE-THIRD OCTAVE BAND CENTER FREQUENCY (Hz)

TITLE: HETF II\CC\OLD MG AC\ECS OFF

FREQ (Hz)	SOUND PRESSURE LEVEL (dB)	OCTAVE BAND SPL (dB)	A-WEIGHTED SOUND LEVEL [dB(A)]	A-WEIGHTED OCTAVE BAND SL [dB(A)]
2.5	33.3		0	
3.15	32.3		0	
4	32.7	36.8	0	0
5	31.4		0	
6.3	40		0	
8	35.5	44.4	0	0
10	41.8		0	
12.5	47		0	
16	49.6	54	0	1
20	50.9		0.4	
25	56.8		12.1	
31.5	64.5	65.1	25.1	25.3
40	47.1		12.5	
50	44.6		14.3	
63	51.4	53.7	25.2	28.8
80	48.8		26.3	
100	59.2		40.1	
125	53.1	60.4	37	43
160	50.8		37.5	
200	45.4		34.6	
250	51.7	53.5	43.1	45.2
315	47		40.4	
400	48.8		44	
500	49.9	53.8	46.7	50.6
630	48.7		46.8	
800	47.3		46.4	
1,000	46.1	50.5	46.1	50.2
1,250	43.4		44	
1,600	42.6		43.6	
2,000	42	46.4	43.2	47.5
2,500	40.6		41.8	
3,150	38.7		39.9	
4,000	37.3	41.8	38.2	42.8
5,000	35.1		35.6	
6,300	38		37.9	
8,000	36.9	40.9	35.8	40.2
10,000	32.3		29.8	

••• OVERALL LEVELS (2.5 - 10,000 Hz) •••

OASPL = 67.4 dB OASLA = 55.5 dB(A)

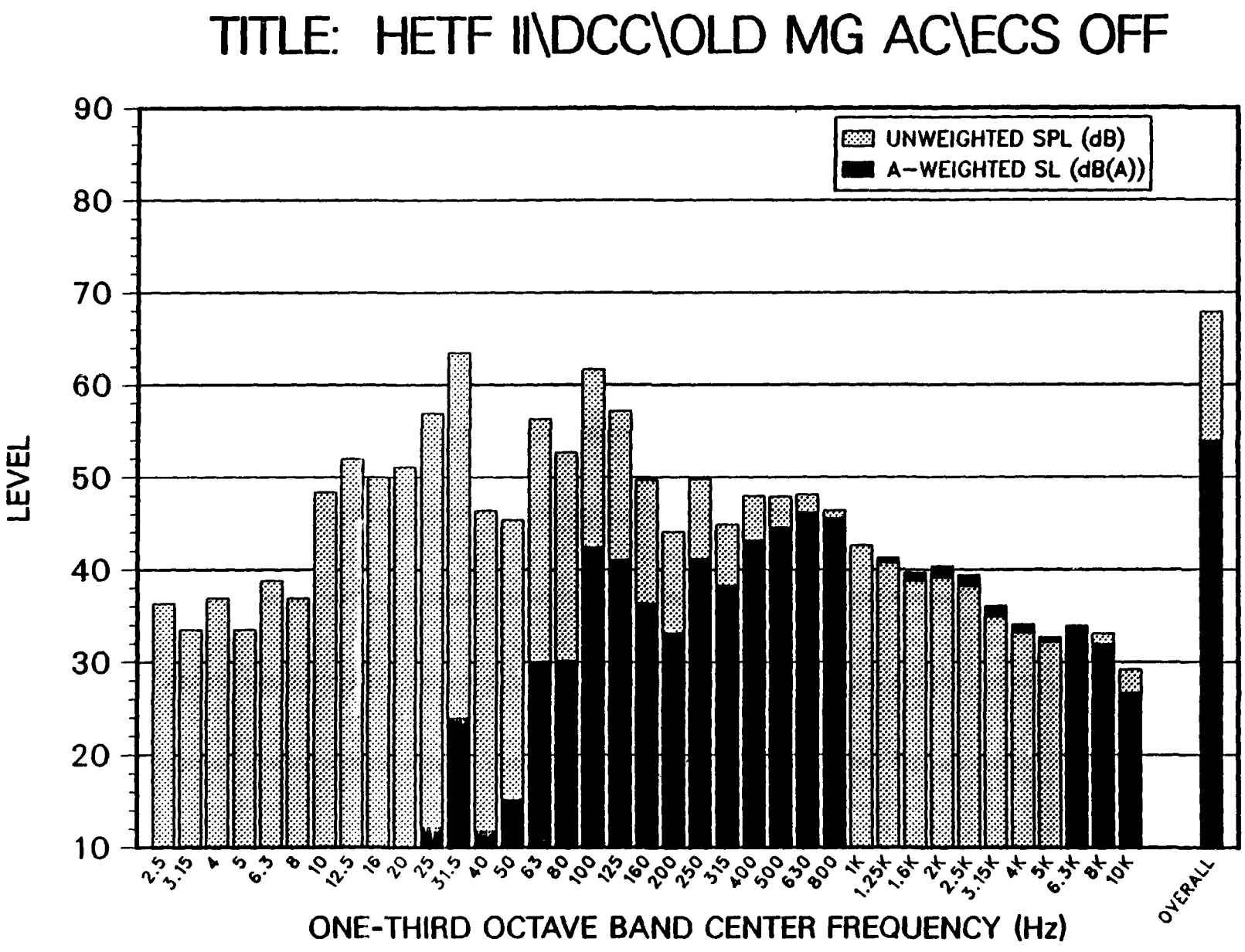

TITLE: HETF II\CC\OLD MG AC\ECS OFF
UNWEIGHTED SPL (dB)
A-WEIGHTED SL (dB(A))
LEVEL
90
80
70
60
50
40
30
20
10
2.5
3.15
4
5
6.3
8
10
12.5
16
20
25
31.5
40
50
63
80
100
125
160
200
250
315
400
500
630
800
1K
1.25K
1.6K
2K
2.5K
3.15K
4K
5K
6.3K
8K
10K
OVERALL
ONE-THIRD OCTAVE BAND CENTER FREQUENCY (Hz)

TITLE: HETF II\DCC\OLD MG AC\ECS OFF

FREQ (Hz)	SOUND PRESSURE LEVEL (dB)	OCTAVE BAND SPL (dB)	A-WEIGHTED SOUND LEVEL [dB(A)]	A-WEIGHTED OCTAVE BAND SL [dB(A)]
2.5	36.3		0	
3.15	33.5		0	
4	36.9	39.5	0	0
5	33.5		0	
6.3	38.8		0	
8	36.9	48.9	0	0
10	48.4		0	
12.5	52		0	
16	50	55.7	0	1.4
20	51.1		0.7	
25	56.9		12.2	
31.5	63.5	64.2	24	24.3
40	46.4		11.8	
50	45.4		15.2	
63	56.3	57.9	30.1	33.1
80	52.7		30.2	
100	61.7		42.5	
125	57.2	63	41.1	45.3
160	49.7		36.4	
200	44.1		33.2	
250	49.8	51.6	41.2	43.2
315	44.9		38.3	
400	48		43.2	
500	47.9	52.6	44.6	49.4
630	48.1		46.2	
800	46.4		45.6	
1,000	42.6	48.5	42.6	48.1
1,250	40.7		41.3	
1,600	38.8		39.7	
2,000	39.2	43.3	40.4	44.5
2,500	38.2		39.4	
3,150	34.9		36.1	
4,000	33.2	38.2	34.1	39.1
5,000	32.2		32.7	
6,300	34		33.9	
8,000	33.1	37.1	32	36.3
10,000	29.2		26.7	

••• OVERALL LEVELS (2.5 - 10,000 Hz) •••

OASPL = 67.9 dB OASLA = 54 dB(A)


TITLE: HETF II\DCC\OLD MG AC\ECS OFF
UNWEIGHTED SPL (dB)
A-WEIGHTED SL (dB(A))
LEVEL
90
80
70
60
50
40
30
20
10
2.5
3.15
4
5
6.3
8
10
12.5
16
20
25
31.5
40
50
63
80
100
125
160
200
250
315
400
500
630
800
1K
1.25K
1.6K
2K
2.5K
3.15K
4K
5K
6.3K
8K
10K
OVERALL
ONE-THIRD OCTAVE BAND CENTER FREQUENCY (Hz)

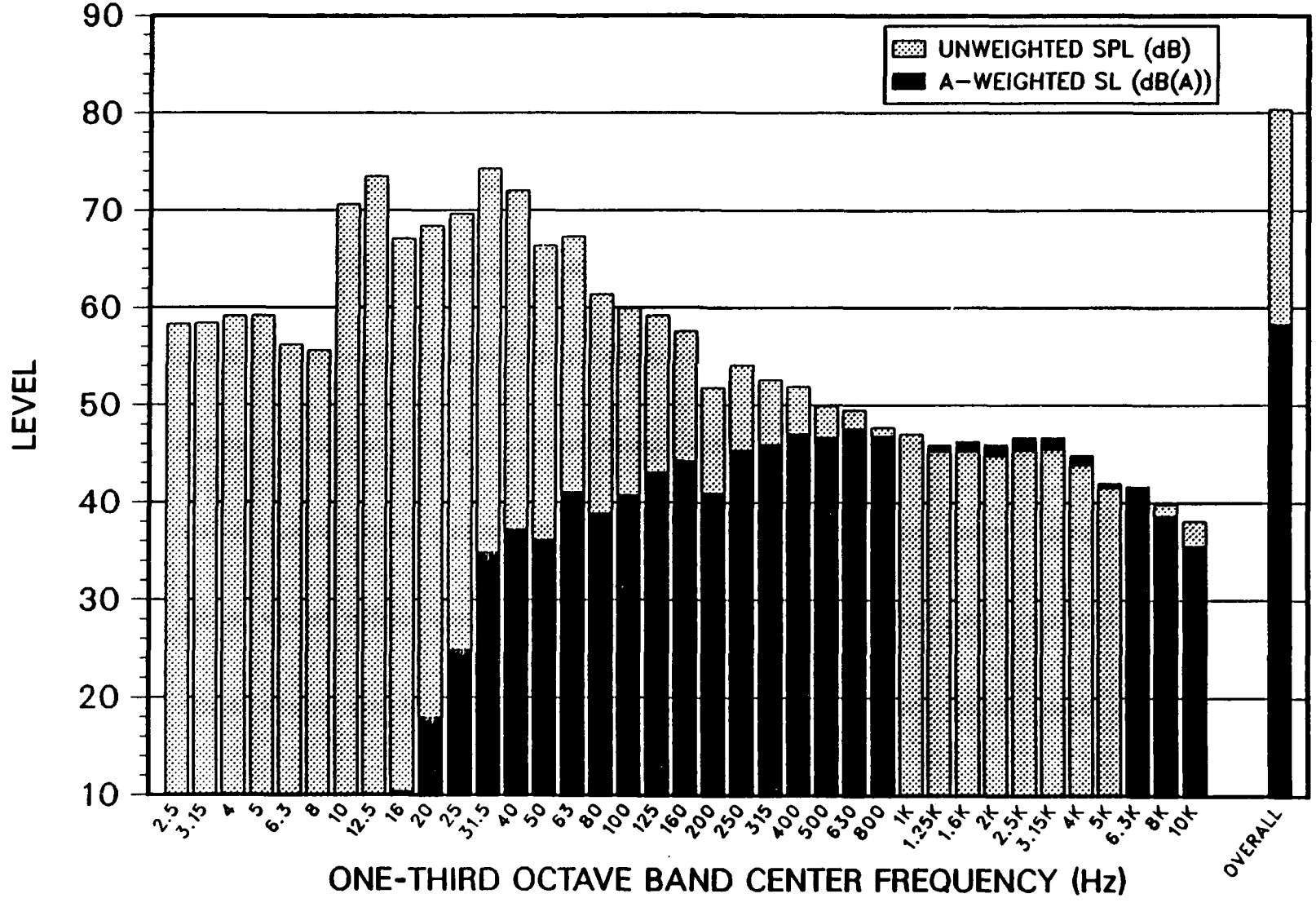
TITLE: HETF II\CC\OLD MG OFF\ECS AC

FREQ (Hz)	SOUND PRESSURE LEVEL (dB)	OCTAVE BAND SPL (dB)	A-WEIGHTED SOUND LEVEL [dB(A)]	A-WEIGHTED OCTAVE BAND SL [dB(A)]
2.5	58.3		0	
3.15	58.4		0	
4	59.1	63.5	0	0
5	59.2		0	
6.3	56.2		0	
8	55.6	70.7	0	0
10	70.6		0.1	
12.5	73.5		10.1	
16	67.1	75.2	10.4	19
20	68.4		18	
25	69.6		24.9	
31.5	74.3	77	34.9	39.2
40	72		37.3	
50	66.4		36.2	
63	67.3	70.2	41.1	43.7
80	61.4		38.9	
100	59.9		40.8	
125	59.2	63.6	43.1	47.5
160	57.6		44.3	
200	51.8		41	
250	54.1	57.5	45.4	49.2
315	52.6		46	
400	51.9		47.1	
500	49.9	55.2	46.7	51.7
630	49.5		47.6	
800	47.7		46.9	
1,000	47	51.4	47	51.2
1,250	45.3		45.9	
1,600	45.3		46.3	
2,000	44.8	49.8	46	50.9
2,500	45.4		46.7	
3,150	45.5		46.7	
4,000	43.9	48.5	44.9	49.5
5,000	41.5		42	
6,300	41.7		41.6	
8,000	39.8	44.7	38.7	43.9
10,000	38.1		35.6	

••• OVERALL LEVELS (2.5 - 10,000 Hz) •••

OASPL = 80.4 dB OASLA = 58.4 dB(A)

TITLE: HETF II\CC\OLD MG OFF\ECS AC



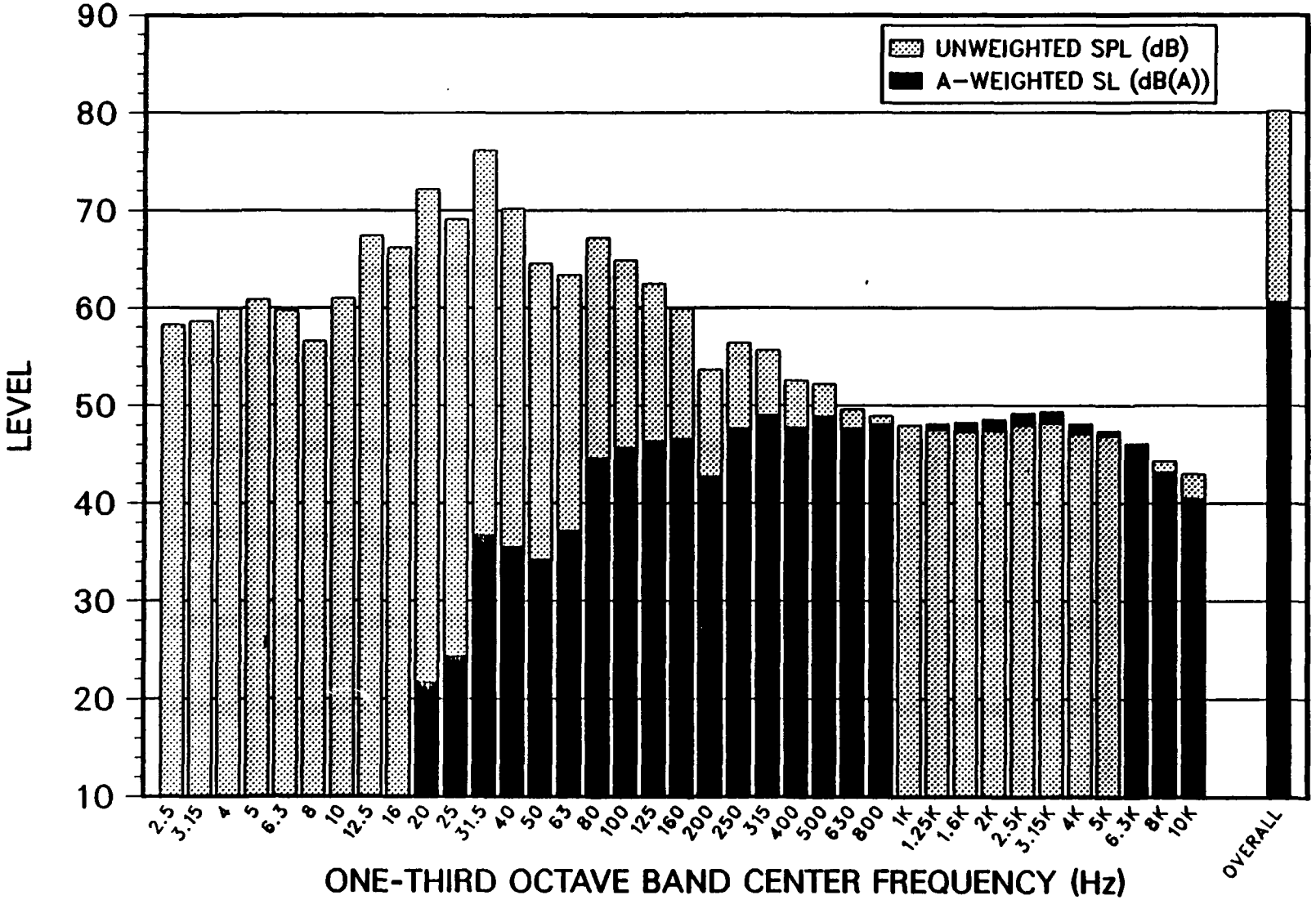
TITLE: HETF II\DCC\OLD MG OFF\ECS AC

FREQ (Hz)	SOUND PRESSURE LEVEL (dB)	OCTAVE BAND SPL (dB)	A-WEIGHTED SOUND LEVEL [dB(A)]	A-WEIGHTED OCTAVE BAND SL [dB(A)]
2.5	58.3		0	
3.15	58.7		0	
4	59.9	64.5	0	0
5	60.9		0	
6.3	59.8		0	
8	56.6	64.1	0	0
10	61		0	
12.5	67.4		4	
16	66.2	74	9.5	21.8
20	72.2		21.7	
25	69.1		24.4	
31.5	76.2	77.6	36.8	39.2
40	70.2		35.6	
50	64.6		34.3	
63	63.4	69.9	37.2	45.5
80	67.2		44.7	
100	64.9		45.7	
125	62.5	67.5	46.4	50.8
160	59.9		46.6	
200	53.7		42.8	
250	56.4	60	47.7	51.8
315	55.7		49.1	
400	52.6		47.8	
500	52.2	56.2	48.9	52.8
630	49.6		47.7	
800	48.9		48.1	
1,000	48	52.7	48	52.6
1,250	47.5		48.1	
1,600	47.3		48.3	
2,000	47.4	52.2	48.6	53.3
2,500	48		49.2	
3,150	48.2		49.4	
4,000	47.1	52	48.1	53
5,000	46.9		47.4	
6,300	46.1		45.9	
8,000	44.3	49.2	43.2	48.3
10,000	43		40.5	

*** OVERALL LEVELS (2.5 - 10,000 Hz) ***

OASPL = 80.2 dB OASLA = 60.7 dB(A)

TITLE: HETF II\DCC\OLD MG OFF\ECS AC

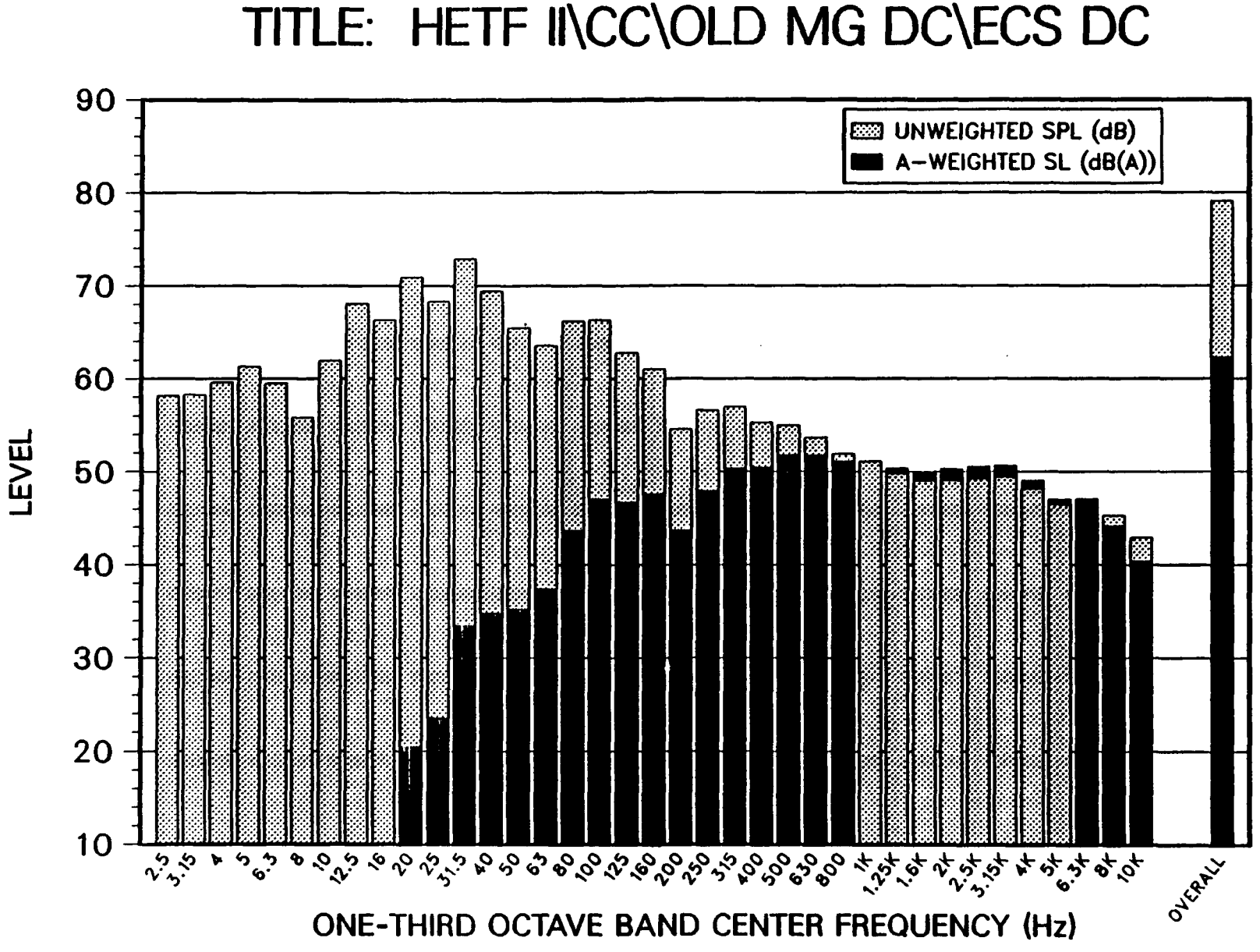


TITLE: HETF II\CC\OLD MG DC\ECS DC

FREQ (Hz)	SOUND PRESSURE LEVEL (dB)	OCTAVE BAND SPL (dB)	A-WEIGHTED SOUND LEVEL [dB(A)]	A-WEIGHTED OCTAVE BAND SL [dB(A)]
2.5	58.2		0	
3.15	58.3		0	
4	59.6	64.5	0	0
5	61.3		0	
6.3	59.5		0	
8	55.8	64.3	0	0
10	62		0	
12.5	68.1		4.7	
16	66.3	73.4	9.6	20.7
20	70.9		20.5	
25	68.3		23.6	
31.5	72.9	75.3	33.5	37.2
40	69.4		34.8	
50	65.5		35.3	
63	63.6	69.8	37.4	44.9
80	66.2		43.7	
100	66.3		47.1	
125	62.8	68.5	46.7	51.8
160	61		47.6	
200	54.6		43.7	
250	56.6	60.8	48	52.7
315	57		50.4	
400	55.3		50.5	
500	55	59.3	51.8	56
630	53.7		51.8	
800	51.9		51.1	
1,000	51.1	55.6	51.1	55.4
1,250	49.8		50.4	
1,600	49.1		50	
2,000	49.1	53.7	50.3	54.9
2,500	49.3		50.6	
3,150	49.5		50.7	
4,000	48.2	52.8	49.1	53.8
5,000	46.5		47	
6,300	47.1		47	
8,000	45.3	50	44.2	49.2
10,000	42.9		40.4	

*** OVERALL LEVELS (2.5 - 10,000 Hz) ***

OASPL = 79.1 dB OASLA = 62.4 dB(A)

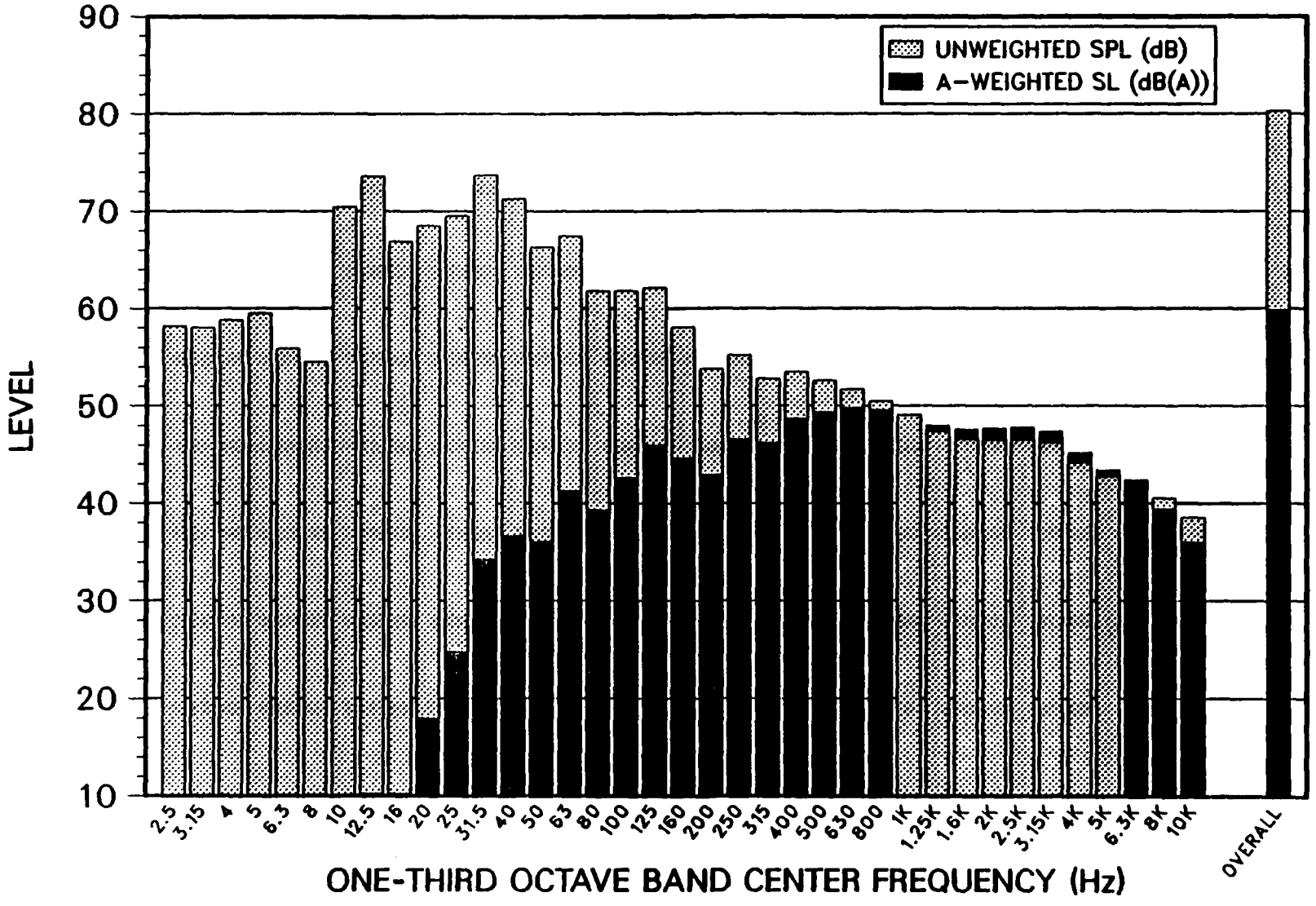

TITLE: HETF II\CC\OLD MG DC\ECS DC
UNWEIGHTED SPL (dB)
A-WEIGHTED SL (dB(A))
LEVEL
90
80
70
60
50
40
30
20
10
2.5
3.15
4
5
6.3
8
10
12.5
16
20
25
31.5
40
50
63
80
100
125
160
200
250
315
400
500
630
800
1K
1.25K
1.6K
2K
2.5K
3.15K
4K
5K
6.3K
8K
10K
OVERALL
ONE-THIRD OCTAVE BAND CENTER FREQUENCY (Hz)

TITLE: HETF II\DCC\OLD MG DC\ECS DC

FREQ (Hz)	SOUND PRESSURE LEVEL (dB)	OCTAVE BAND SPL (dB)	A-WEIGHTED SOUND LEVEL [dB(A)]	A-WEIGHTED OCTAVE BAND SL [dB(A)]
2.5	58.2		0	
3.15	58		0	
4	58.8	63.4	0	0
5	59.5		0	
6.3	55.9		0	
8	54.5	70.6	0	0
10	70.5		0.1	
12.5	73.6		10.2	
16	66.9	75.2	10.2	19.1
20	68.5		18	
25	69.5		24.8	
31.5	73.7	76.4	34.3	38.6
40	71.3		36.7	
50	66.3		36.1	
63	67.5	70.4	41.3	43.9
80	61.8		39.3	
100	61.8		42.6	
125	62.1	65.6	46	49.2
160	58.1		44.7	
200	53.8		42.9	
250	55.2	58.6	46.6	50.1
315	52.8		46.2	
400	53.5		48.7	
500	52.6	57.2	49.4	53.9
630	51.7		49.8	
800	50.5		49.6	
1,000	49.1	53.7	49.1	53.5
1,250	47.4		48	
1,600	46.6		47.6	
2,000	46.5	51.1	47.7	52.3
2,500	46.5		47.8	
3,150	46.2		47.4	
4,000	44.2	49.2	45.2	50.2
5,000	42.8		43.4	
6,300	42.4		42.3	
8,000	40.5	45.3	39.4	44.5
10,000	38.5		36	

*** OVERALL LEVELS (2.5 - 10,000 Hz) ***

OASPL = 80.3 dB OASLA = 59.9 dB(A)

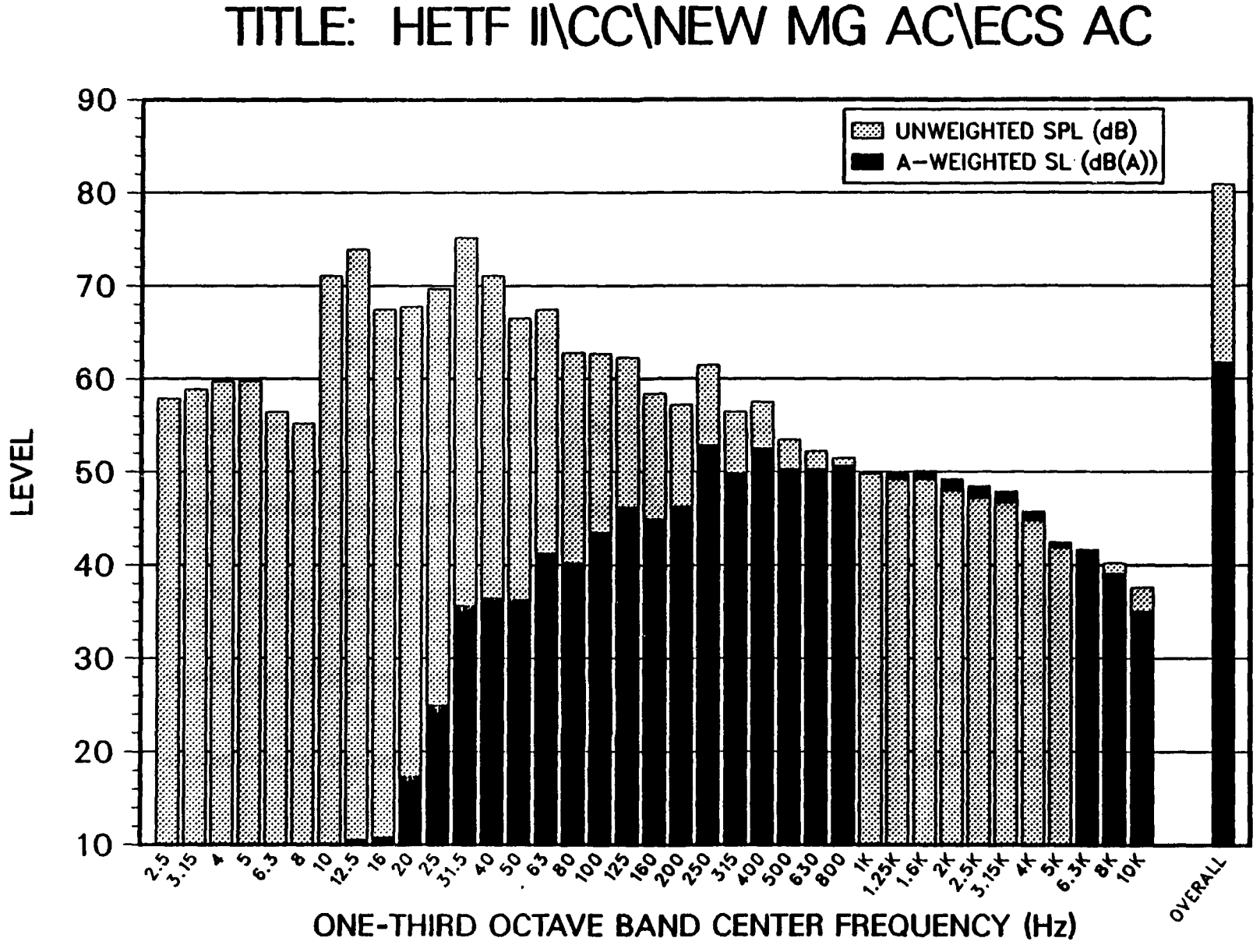

TITLE: HETF II\DCC\OLD MG DC\ECS DC
UNWEIGHTED SPL (dB)
A-WEIGHTED SL (dB(A))
LEVEL
90
80
70
60
50
40
30
20
10
2.5
3.15
4
5
6.3
8
10
12.5
16
20
25
31.5
40
50
63
80
100
125
160
200
250
315
400
500
630
800
1K
1.25K
1.6K
2K
2.5K
3.15K
4K
5K
6.3K
8K
10K
OVERALL
ONE-THIRD OCTAVE BAND CENTER FREQUENCY (Hz)

TITLE: HETF II\CC\NEW MG AC\ECS AC

FREQ (Hz)	SOUND PRESSURE LEVEL (dB)	OCTAVE BAND SPL (dB)	A-WEIGHTED SOUND LEVEL [dB(A)]	A-WEIGHTED OCTAVE BAND SL [dB(A)]
2.5	57.9		0	
3.15	58.9		0	
4	59.7	64	0	0
5	59.8		0	
6.3	56.5		0	
8	55.2	71.1	0	0.5
10	71.1		0.6	
12.5	73.9		10.5	
16	67.5	75.4	10.8	18.7
20	67.8		17.4	
25	69.7		25	
31.5	75.2	77.2	35.7	39.1
40	71.1		36.5	
50	66.5		36.3	
63	67.5	70.6	41.3	44.3
80	62.8		40.3	
100	62.7		43.5	
125	62.3	66.1	46.2	49.6
160	58.4		45	
200	57.2		46.3	
250	61.5	63.6	52.9	55
315	56.5		49.9	
400	57.5		52.6	
500	53.5	59.6	50.3	55.8
630	52.2		50.3	
800	51.5		50.7	
1,000	49.8	54.9	49.8	54.7
1,250	49.2		49.8	
1,600	49.2		50.1	
2,000	48	52.8	49.2	53.9
2,500	47.2		48.5	
3,150	46.7		47.9	
4,000	44.8	49.5	45.8	50.5
5,000	41.9		42.5	
6,300	41.7		41.6	
8,000	40.2	44.7	39.1	43.9
10,000	37.6		35.1	

*** OVERALL LEVELS (2.5 - 10,000 Hz) ***

OASPL = 80.9 dB OASLA = 61.8 dB(A)

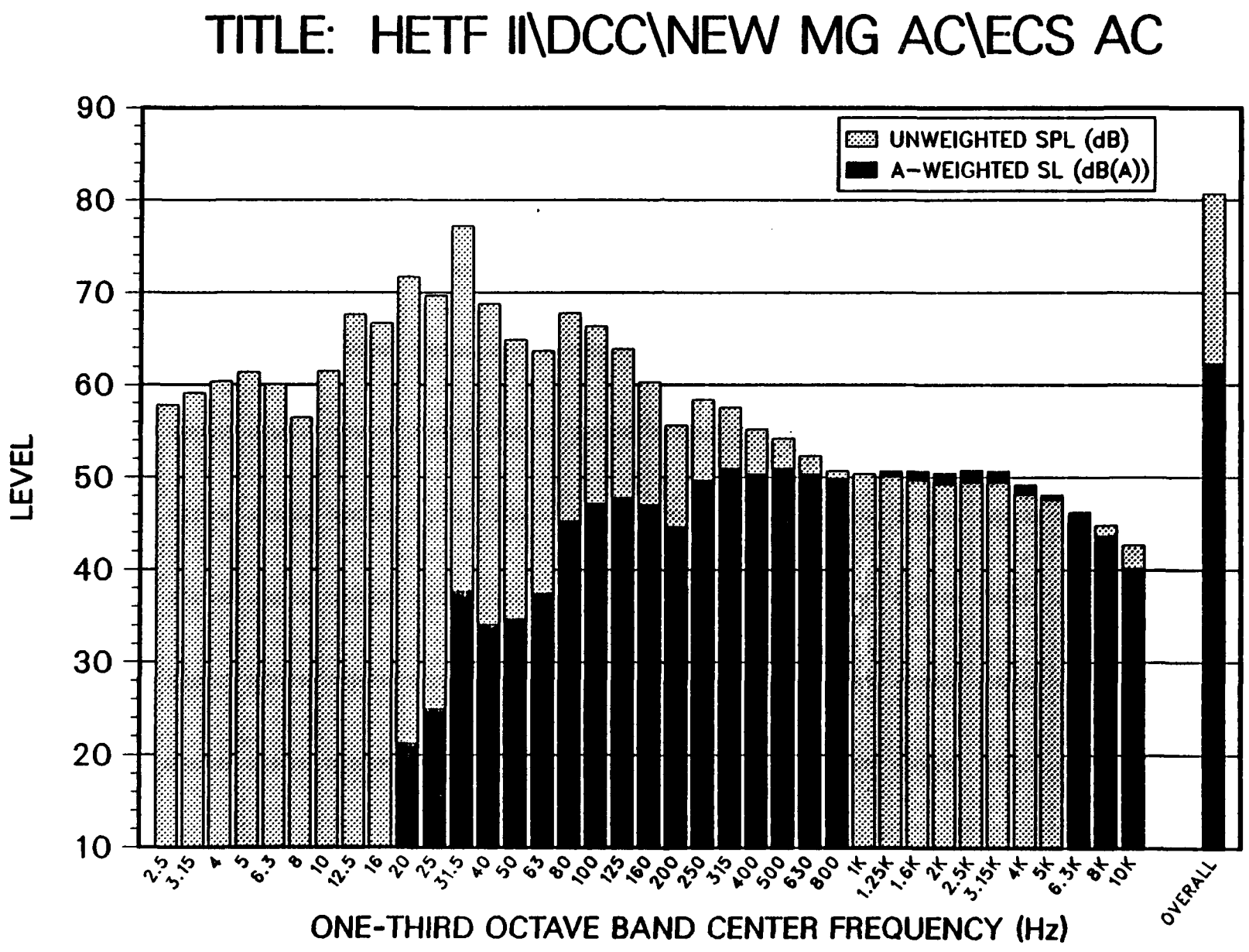

TITLE: HETF II\CC\NEW MG AC\ECS AC
UNWEIGHTED SPL (dB)
A-WEIGHTED SL (dB(A))
LEVEL
90
80
70
60
50
40
30
20
10
2.5
3.15
4
5
6.3
8
10
12.5
16
20
25
31.5
40
50
63
80
100
125
160
200
250
315
400
500
630
800
1K
1.25K
1.6K
2K
2.5K
3.15K
4K
5K
6.3K
8K
10K
OVERALL
ONE-THIRD OCTAVE BAND CENTER FREQUENCY (Hz)

TITLE: HETF II\DCC\NEW MG AC\ECS AC

FREQ (Hz)	SOUND PRESSURE LEVEL (dB)	OCTAVE BAND SPL (dB)	A-WEIGHTED SOUND LEVEL [dB(A)]	A-WEIGHTED OCTAVE BAND SL [dB(A)]
2.5	57.8		0	
3.15	59.1		0	
4	60.4	65	0	0
5	61.4		0	
6.3	60.1		0	
8	56.5	64.4	0	0
10	61.5		0	
12.5	67.6		4.3	
16	66.7	73.9	10	21.5
20	71.7		21.3	
25	69.7		25	
31.5	77.2	78.2	37.7	39.3
40	68.8		34.1	
50	64.9		34.7	
63	63.7	70.4	37.5	46.1
80	67.8		45.3	
100	66.4		47.2	
125	63.9	68.8	47.8	51.9
160	60.3		47	
200	55.6		44.7	
250	58.4	61.9	49.7	53.8
315	57.6		51	
400	55.2		50.4	
500	54.2	58.7	51	55.2
630	52.3		50.4	
800	50.7		49.9	
1,000	50.4	55	50.4	54.9
1,250	50.1		50.7	
1,600	49.7		50.7	
2,000	49.3	54.1	50.5	55.2
2,500	49.5		50.8	
3,150	49.5		50.7	
4,000	48.2	53.1	49.2	54
5,000	47.6		48.1	
6,300	46.3		46.2	
8,000	44.8	49.4	43.7	48.6
10,000	42.7		40.2	

*** OVERALL LEVELS (2.5 - 10,000 Hz) ***

OASPL = 80.7 dB OASLA = 62.4 dB(A)


TITLE: HETF II\DCC\NEW MG AC\ECS AC
UNWEIGHTED SPL (dB)
A-WEIGHTED SL (dB(A))
LEVEL
90
80
70
60
50
40
30
20
10
2.5
3.15
4
5
6.3
8
10
12.5
16
20
25
31.5
40
50
63
80
100
125
160
200
250
315
400
500
630
800
1K
1.25K
1.6K
2K
2.5K
3.15K
4K
5K
6.3K
8K
10K
OVERALL
ONE-THIRD OCTAVE BAND CENTER FREQUENCY (Hz)

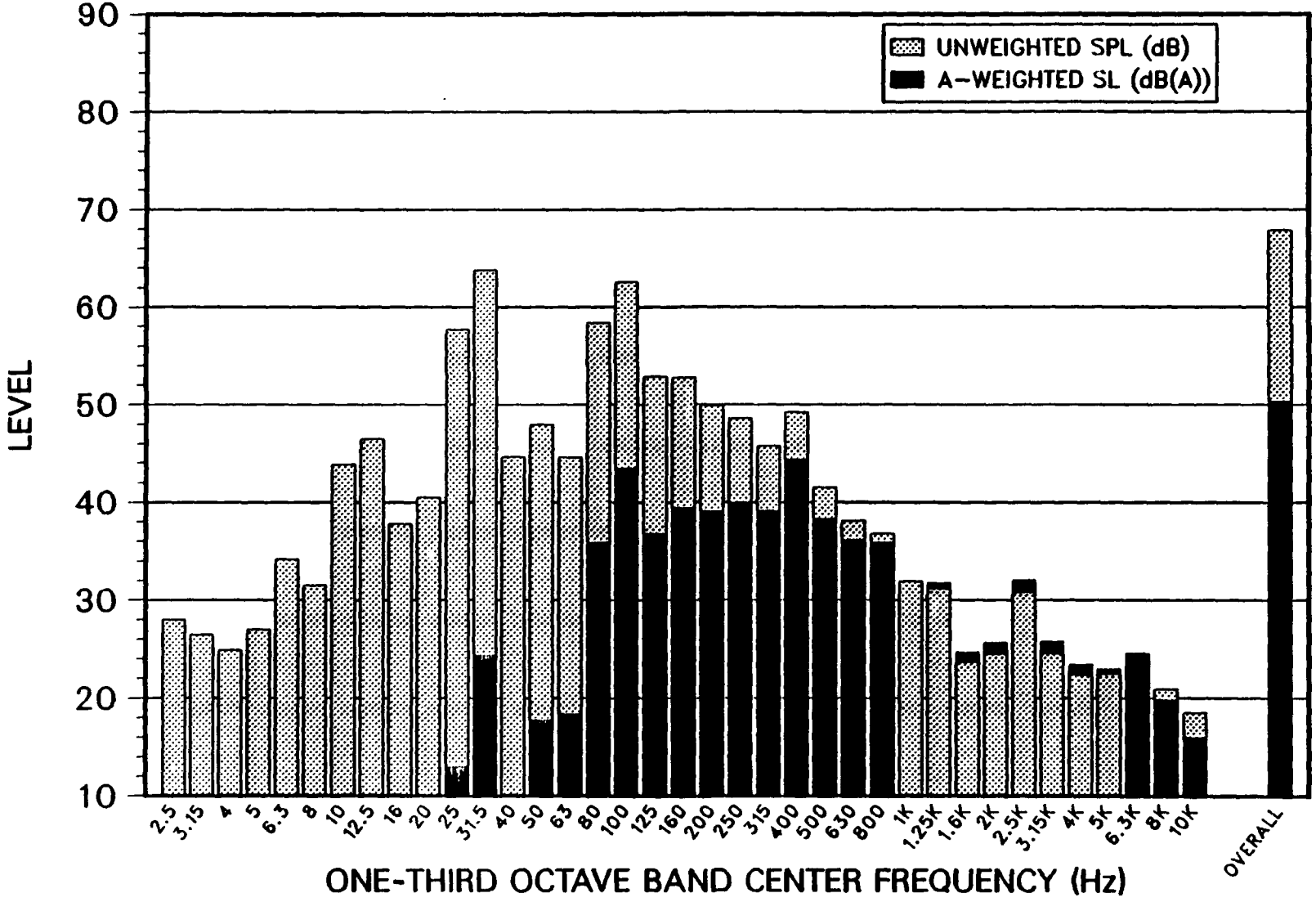
TITLE: HETF II\CC\NEW MG AC\ECS OFF

FREQ (Hz)	SOUND PRESSURE LEVEL (dB)	OCTAVE BAND SPL (dB)	A-WEIGHTED SOUND LEVEL [dB(A)]	A-WEIGHTED OCTAVE BAND SL [dB(A)]
2.5	28		0	
3.15	26.5		0	
4	24.9	30.8	0	0
5	27		0	
6.3	34.2		0	
8	31.5	44.4	0	0
10	43.9		0	
12.5	46.5		0	
16	37.8	47.7	0	0
20	40.5		0	
25	57.7		13	
31.5	63.8	64.6	24.4	24.7
40	44.7		10.1	
50	48		17.8	
63	44.6	58.7	18.4	35.8
80	58.4		35.9	
100	62.6		43.5	
125	52.9	63.3	36.8	45.4
160	52.8		39.5	
200	49.9		39.1	
250	48.6	53	40	44
315	45.8		39.2	
400	49.2		44.4	
500	41.5	49.9	38.3	45.6
630	38.1		36.2	
800	36.8		35.9	
1,000	31.9	38.6	31.9	38.3
1,250	31.2		31.8	
1,600	23.7		24.7	
2,000	24.5	32.1	25.7	33.4
2,500	30.8		32.1	
3,150	24.6		25.8	
4,000	22.4	27.9	23.4	28.8
5,000	22.5		23	
6,300	24.6		24.5	
8,000	20.9	26.7	19.8	26
10,000	18.5		16	

*** OVERALL LEVELS (2.5 - 10,000 Hz) ***

OASPL = 67.9 dB OASLA = 50.4 dB(A)

TITLE: HETF II\CC\NEW MG AC\ECS OFF

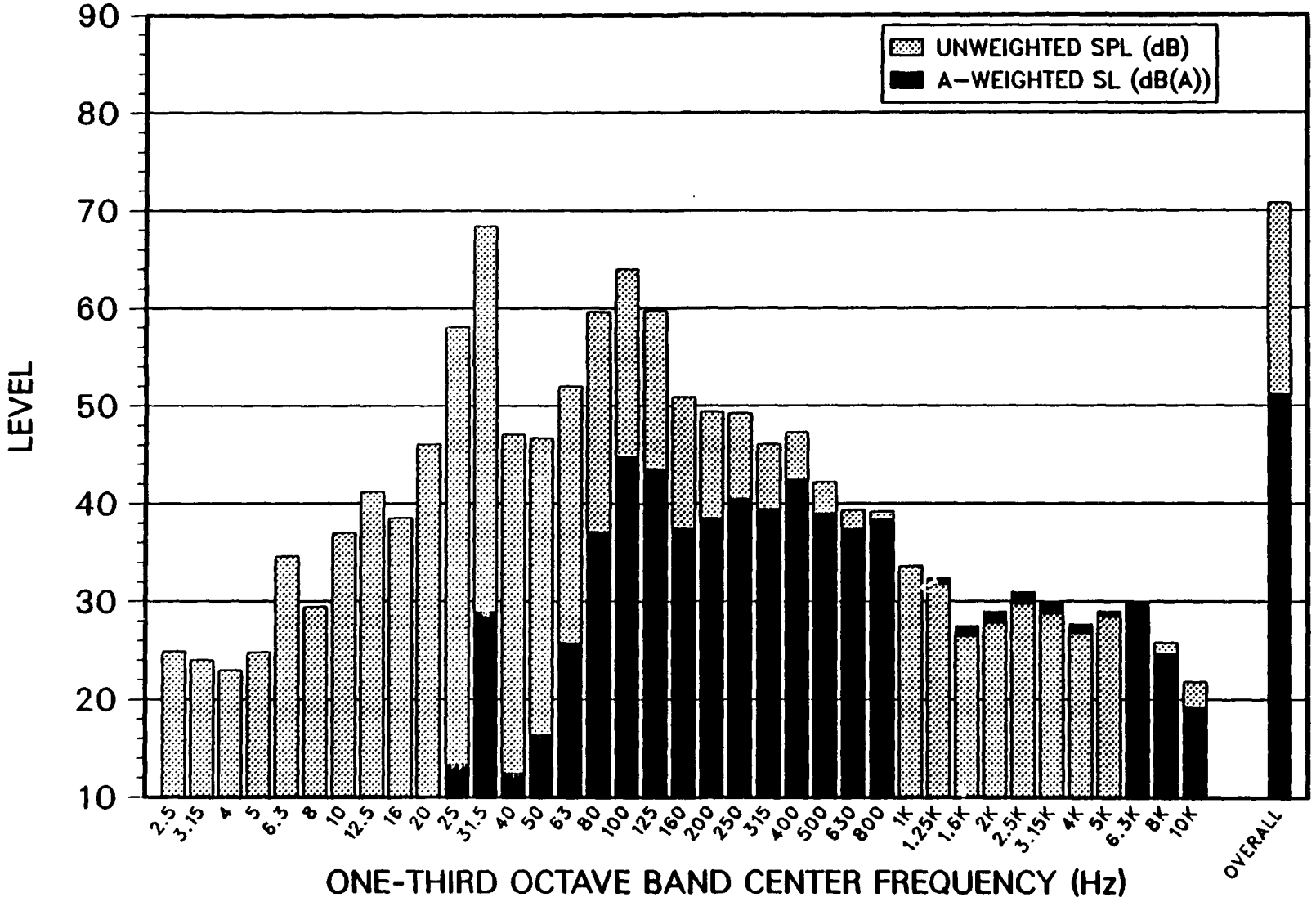


TITLE: HETF II\DCC\NEW MG AC\ECS OFF

FREQ (Hz)	SOUND PRESSURE LEVEL (dB)	OCTAVE BAND SPL (dB)	A-WEIGHTED SOUND LEVEL [dB(A)]	A-WEIGHTED OCTAVE BAND SL [dB(A)]
2.5	24.9		0	
3.15	24		0	
4	23	28.6	0	0
5	24.8		0	
6.3	34.6		0	
8	29.4	39.3	0	0
10	37		0	
12.5	41.2		0	
16	38.5	47.7	0	0
20	46.1		0	
25	58.1		13.4	
31.5	68.4	68.7	29	29
40	47.1		12.5	
50	46.7		16.4	
63	52	60.3	25.8	37.3
80	59.6		37.1	
100	64		44.8	
125	59.7	65.3	43.6	47.5
160	50.9		37.5	
200	49.4		38.5	
250	49.2	53	40.5	44.2
315	46.1		39.5	
400	47.3		42.5	
500	42.2	48.8	39	44.7
630	39.3		37.4	
800	39.2		38.4	
1,000	33.6	40.6	33.6	40.2
1,250	31.8		32.4	
1,600	26.5		27.5	
2,000	27.8	32.8	29	34
2,500	29.8		31	
3,150	28.8		30	
4,000	26.8	32.7	27.7	33.6
5,000	28.5		29	
6,300	30		29.9	
8,000	25.8	31.7	24.7	31.1
10,000	21.8		19.3	

*** OVERALL LEVELS (2.5 - 10,000 Hz) ***

OASPL = 70.8 dB OASLA = 51.3 dB(A)


TITLE: HETF II\DCC\NEW MG AC\ECS OFF
UNWEIGHTED SPL (dB)
A-WEIGHTED SL (dB(A))
LEVEL
90
80
70
60
50
40
30
20
10
2.5
3.15
4
5
6.3
8
10
12.5
16
20
25
31.5
40
50
63
80
100
125
160
200
250
315
400
500
630
800
1K
1.25K
1.6K
2K
2.5K
3.15K
4K
5K
6.3K
8K
10K
OVERALL
ONE-THIRD OCTAVE BAND CENTER FREQUENCY (Hz)

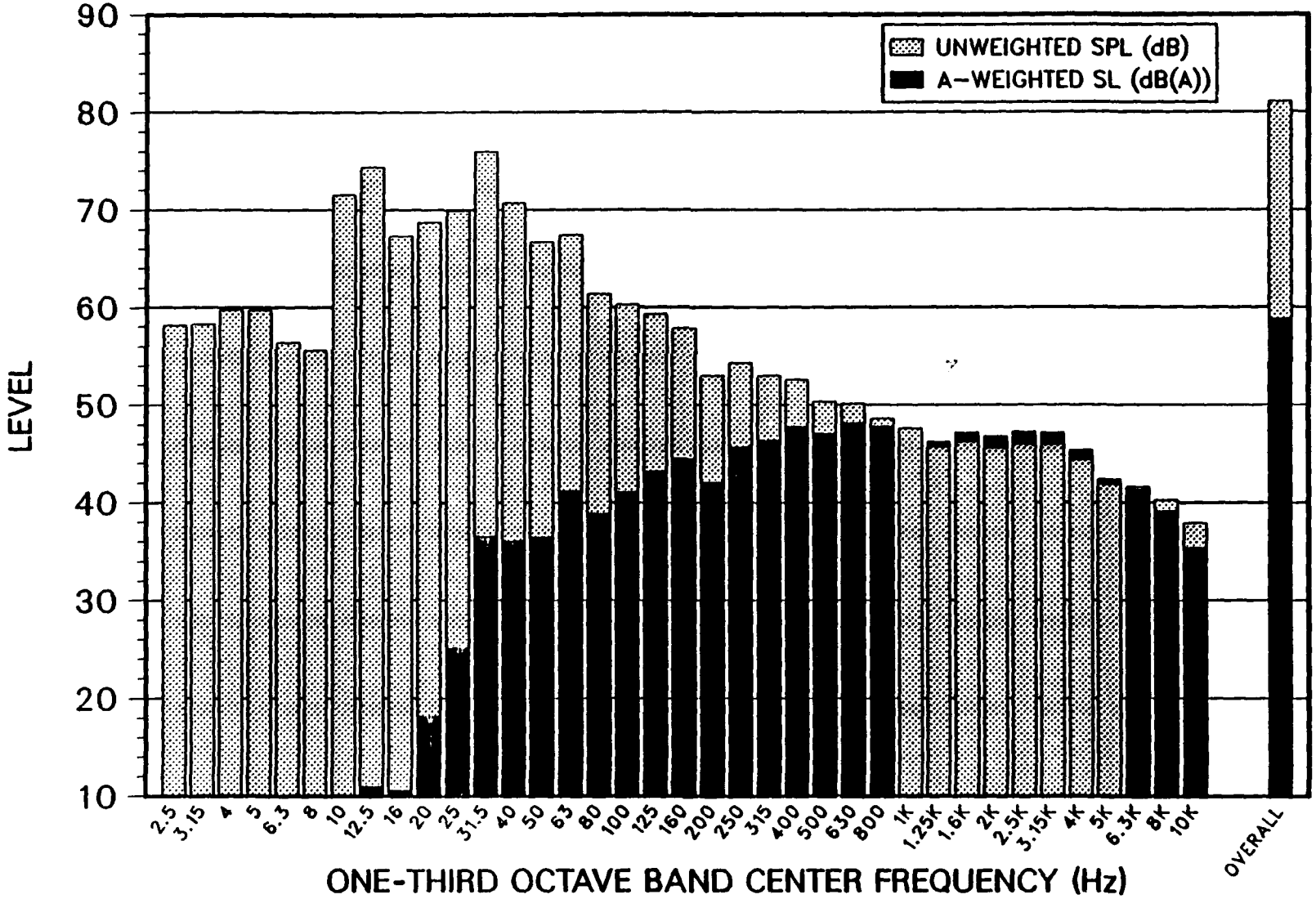
TITLE: HETF II\CC\NEW MG OFF\ECS AC

FREQ (Hz)	SOUND PRESSURE LEVEL (dB)	OCTAVE BAND SPL (dB)	A-WEIGHTED SOUND LEVEL [dB(A)]	A-WEIGHTED OCTAVE BAND SL [dB(A)]
2.5	58.2		0	
3.15	58.3		0	
4	59.8	63.9	0	0
5	59.7		0	
6.3	56.4		0	
8	55.6	71.6	0	1
10	71.6		1.1	
12.5	74.4		11	
16	67.3	75.8	10.6	19.4
20	68.7		18.2	
25	69.9		25.2	
31.5	76	77.7	36.6	39.3
40	70.7		36.1	
50	66.7		36.5	
63	67.4	70.5	41.2	43.9
80	61.4		38.9	
100	60.3		41.1	
125	59.3	63.9	43.2	47.8
160	57.9		44.5	
200	53		42.1	
250	54.3	58.1	45.7	49.7
315	53		46.4	
400	52.6		47.8	
500	50.3	55.7	47.1	52.3
630	50.1		48.2	
800	48.6		47.8	
1,000	47.6	52	47.6	51.8
1,250	45.7		46.2	
1,600	46.2		47.2	
2,000	45.6	50.5	46.8	51.7
2,500	46		47.3	
3,150	46		47.2	
4,000	44.4	49	45.4	50
5,000	41.9		42.4	
6,300	41.6		41.4	
8,000	40.3	44.7	39.2	43.9
10,000	37.9		35.4	

*** OVERALL LEVELS (2.5 - 10,000 Hz) ***

OASPL = 81.1 dB OASLA = 58.9 dB(A)

TITLE: HETF II\CC\NEW MG OFF\ECS AC



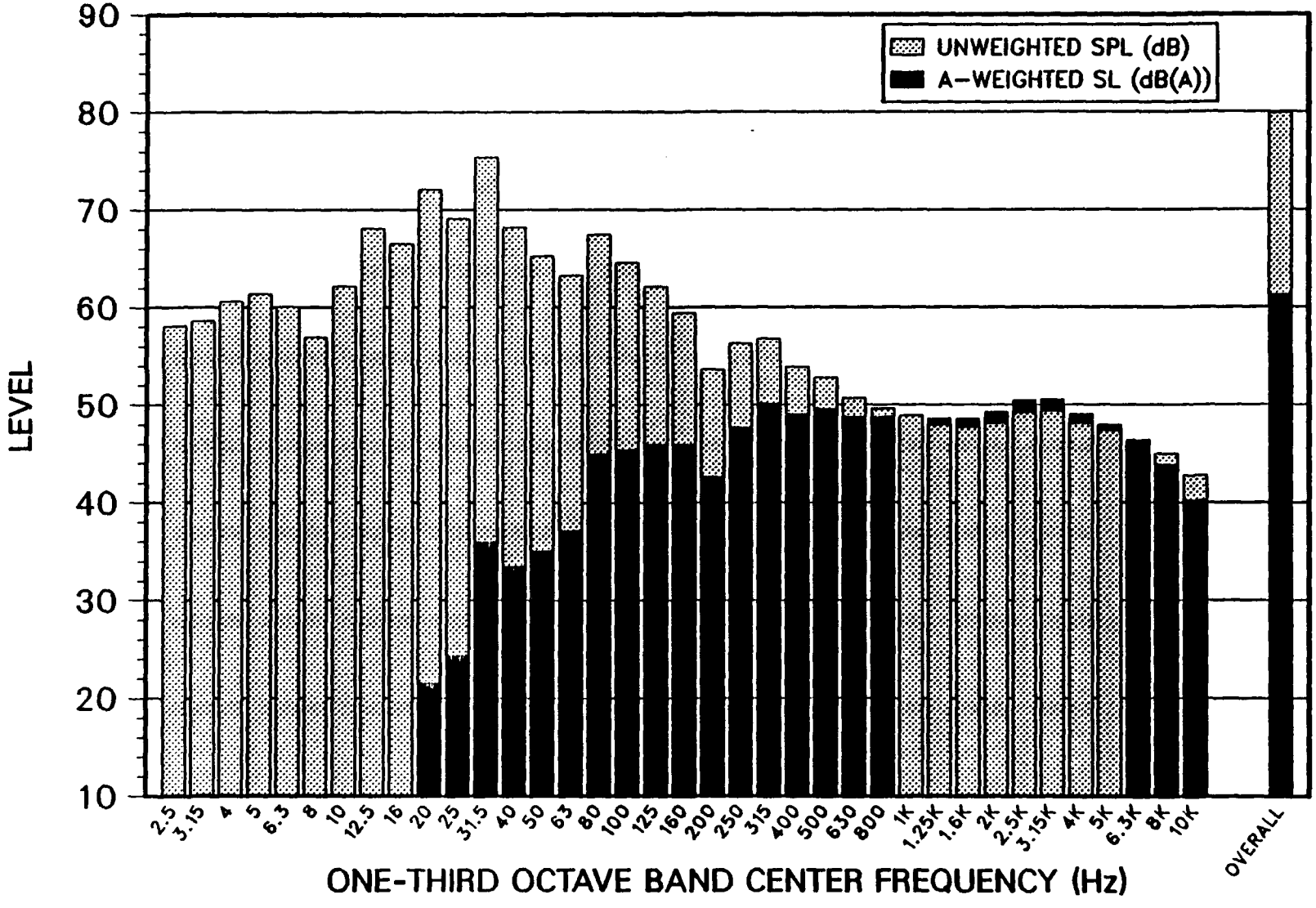
TITLE: HETF II\DCC\NEW MG OFF\ECS AC

FREQ (Hz)	SOUND PRESSURE LEVEL (dB)	OCTAVE BAND SPL (dB)	A-WEIGHTED SOUND LEVEL [dB(A)]	A-WEIGHTED OCTAVE BAND SL [dB(A)]
2.5	58.1		0	
3.15	58.6		0	
4	60.6	64.9	0	0
5	61.4		0	
6.3	60.1		0	
8	56.9	64.8	0	0
10	62.2		0	
12.5	68.1		4.7	
16	66.5	74.1	9.9	21.8
20	72.1		21.6	
25	69.1		24.4	
31.5	75.4	76.7	36	37.9
40	68.2		33.5	
50	65.3		35.1	
63	63.3	70.3	37.1	45.8
80	67.5		45	
100	64.6		45.4	
125	62.1	67.1	46	50.4
160	59.4		46	
200	53.6		42.7	
250	56.3	60.3	47.7	52.4
315	56.8		50.2	
400	53.9		49.1	
500	52.8	57.2	49.6	53.8
630	50.7		48.8	
800	49.6		48.8	
1,000	48.9	53.5	48.9	53.3
1,250	48		48.6	
1,600	47.7		48.6	
2,000	48.1	52.9	49.3	54.1
2,500	49.2		50.5	
3,150	49.4		50.6	
4,000	48.1	53	49.1	53.9
5,000	47.4		48	
6,300	46.4		46.3	
8,000	45	49.6	43.9	48.7
10,000	42.8		40.3	

*** OVERALL LEVELS (2.5 - 10,000 Hz) ***

OASPL = 79.9 dB OASLA = 61.3 dB(A)

TITLE: HETF II\DCC\NEW MG OFF\ECS AC



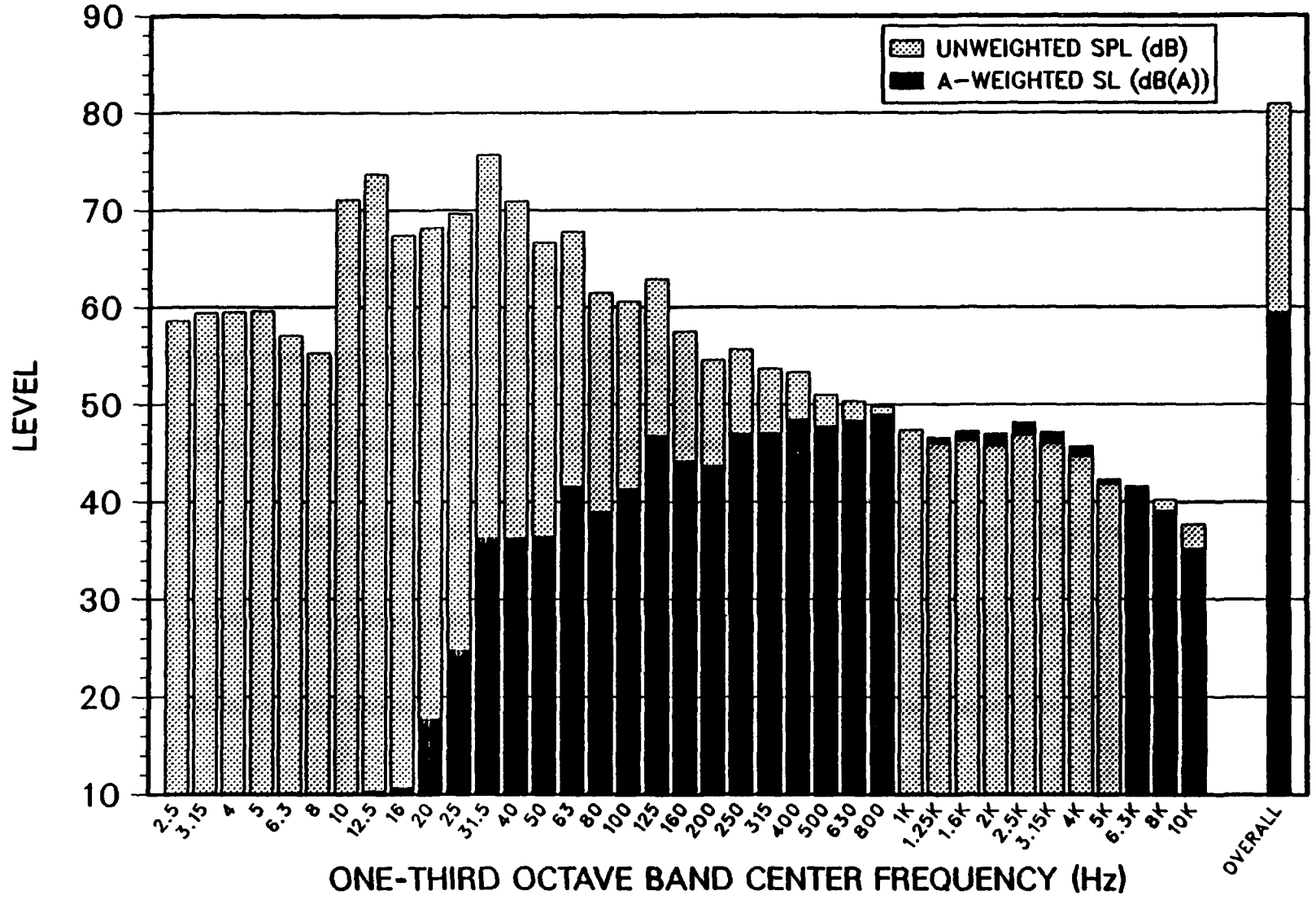
TITLE: HETF II\CC\NEW MG DC\ECS DC

FREQ (Hz)	SOUND PRESSURE LEVEL (dB)	OCTAVE BAND SPL (dB)	A-WEIGHTED SOUND LEVEL [dB(A)]	A-WEIGHTED OCTAVE BAND SL [dB(A)]
2.5	58.6		0	
3.15	59.4		0	
4	59.5	64	0	0
5	59.6		0	
6.3	57.1		0	
8	55.3	71.2	0	0.5
10	71.1		0.6	
12.5	73.7		10.3	
16	67.4	75.3	10.7	19
20	68.2		6.3	
25	69.6			
31.5	75.7	77.5		39.2
40	70.9		36.3	
50	66.7		36.5	
63	67.8	70.6	41.6	44.1
80	61.5		39	
100	60.6		41.4	
125	62.9	65.4	46.8	49.2
160	57.5		44.2	
200	54.6		43.7	
250	55.7	59.3	47	50.8
315	53.7		47.1	
400	53.3		48.5	
500	51	56.3	47.8	52.8
630	50.3		48.4	
800	49.8		49	
1,000	47.4	52.6	47.4	52.3
1,250	46		46.6	
1,600	46.3		47.3	
2,000	45.8	50.9	47	52.1
2,500	46.9		48.2	
3,150	46		47.2	
4,000	44.7	49.1	45.7	50.1
5,000	41.8		42.3	
6,300	41.6		41.5	
8,000	40.2	44.7	39.1	43.9
10,000	37.7		35.2	

••• OVERALL LEVELS (2.5 - 10,000 Hz) •••

OASPL = 80.9 dB OASLA = 59.5 dB(A)

TITLE: HETF II\CC\NEW MG DC\ECS DC

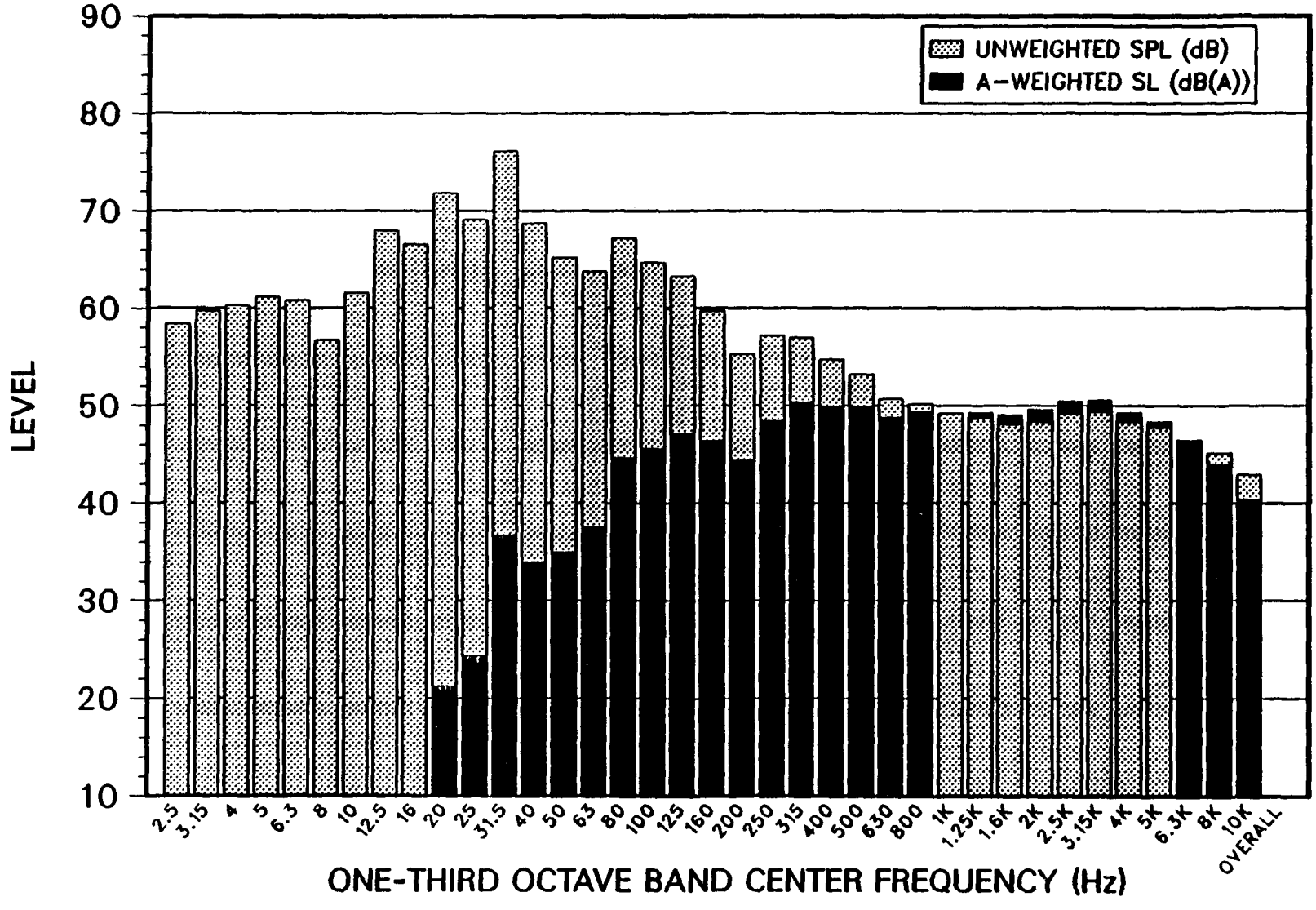


TITLE: HETF II\DCC\NEW MG DC\ECS DC

FREQ (Hz)	SOUND PRESSURE LEVEL (dB)	OCTAVE BAND SPL (dB)	A-WEIGHTED SOUND LEVEL [dB(A)]	A-WEIGHTED OCTAVE BAND SL [dB(A)]
2.5	58.4		0	
3.15	59.7		0	
4	60.3	65	0	0
5	61.2		0	
6.3	60.8		0	
8	56.7	64.8	0	0
10	61.6		0	
12.5	68		4.6	
16	66.6	73.9	9.9	21.5
20	71.8		21.3	
25	69.1		24.4	
31.5	76.1	77.3	36.7	38.6
40	68.7		34	
50	65.2		35	
63	63.8	70.2	37.6	45.7
80	67.2		44.7	
100	64.7		45.6	
125	63.3	67.6	47.2	51
160	59.7		46.4	
200	55.3		44.4	
250	57.2	61.1	48.5	53
315	57		50.4	
400	54.7		49.9	
500	53.2	57.7	49.9	54.2
630	50.7		48.8	
800	50.2		49.4	
1,000	49.2	54	49.2	53.8
1,250	48.7		49.3	
1,600	48.1		49.1	
2,000	48.4	53.2	49.6	54.4
2,500	49.2		50.5	
3,150	49.4		50.6	
4,000	48.4	53.2	49.3	54.1
5,000	47.8		48.4	
6,300	46.5		46.4	
8,000	45.1	49.7	44	48.8
10,000	42.9		40.4	

*** OVERALL LEVELS (2.5 - 10,000 Hz) ***

OASPL = 80.2 dB OASLA = 61.7 dB(A)

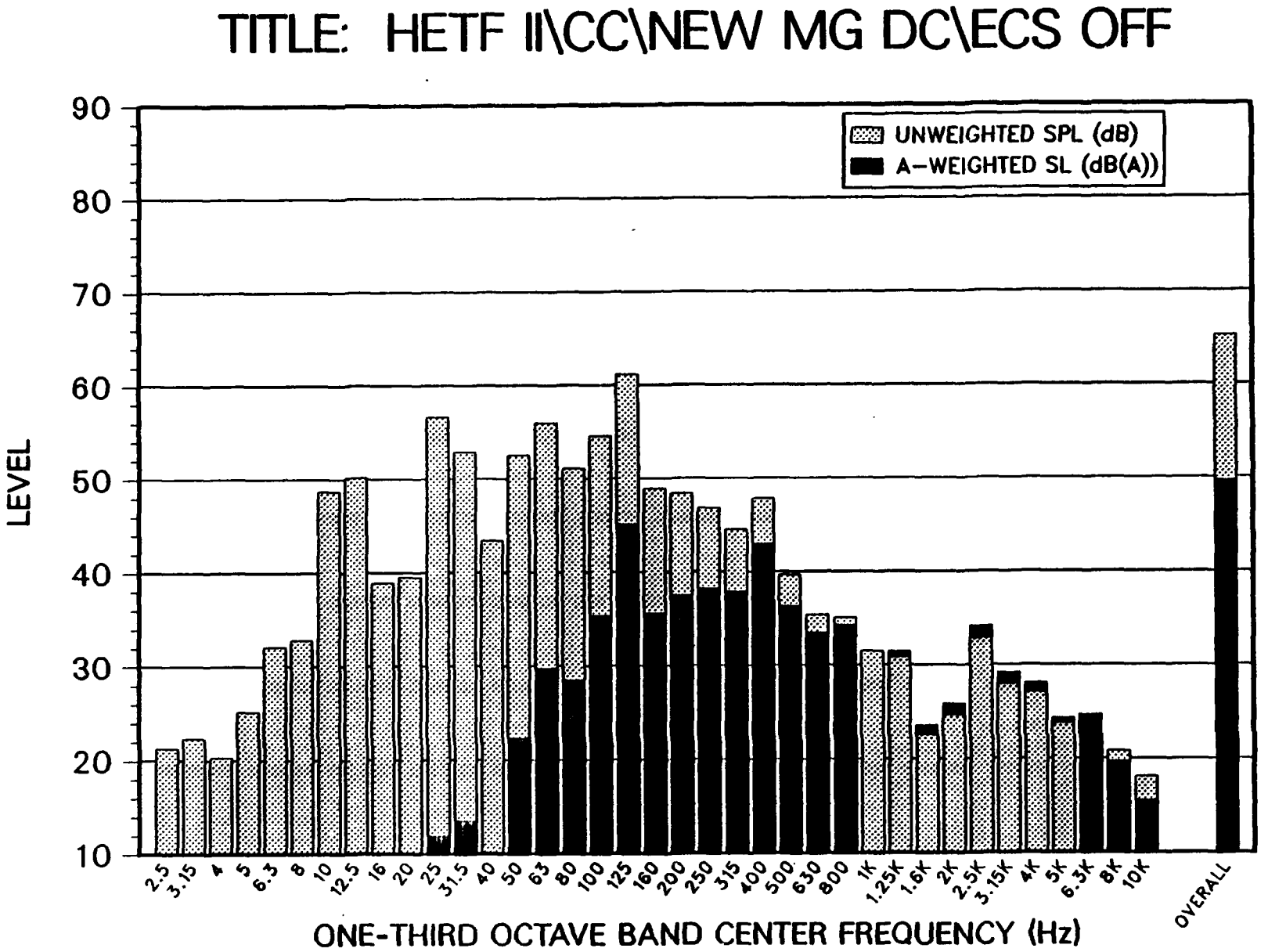

TITLE: HETF II\DCC\NEW MG DC\ECS DC
UNWEIGHTED SPL (dB)
A-WEIGHTED SL (dB(A))
LEVEL
90
80
70
60
50
40
30
20
10
2.5
3.15
4
5
6.3
8
10
12.5
16
20
25
31.5
40
50
63
80
100
125
160
200
250
315
400
500
630
800
1K
1.25K
1.6K
2K
2.5K
3.15K
4K
5K
6.3K
8K
10K
OVERALL
ONE-THIRD OCTAVE BAND CENTER FREQUENCY (Hz)

TITLE: HETF II\CC\NEW MG DC\ECS OFF

FREQ (Hz)	SOUND PRESSURE LEVEL (dB)	OCTAVE BAND SPL (dB)	A-WEIGHTED SOUND LEVEL [dB(A)]	A-WEIGHTED OCTAVE BAND SL [dB(A)]
2.5	21.3		0	
3.15	22.3		0	
4	20.3	27.7	0	0
5	25.2		0	
6.3	32.1		0	
8	32.8	48.7	0	0
10	48.7		0	
12.5	50.2		0	
16	38.9	50.7	0	0
20	39.5		0	
25	56.6		11.9	
31.5	52.9	58.1	13.5	16.4
40	43.4		8.8	
50	52.5		22.3	
63	56	58.3	29.8	32.4
80	51.1		28.5	
100	54.6		35.4	
125	61.2	62.1	45.1	45.8
160	48.9		35.6	
200	48.4		37.5	
250	46.8	51.4	38.2	42.5
315	44.5		37.9	
400	47.8		43	
500	39.6	48.5	36.3	44.1
630	35.4		33.5	
800	35.1		34.3	
1,000	31.5	37.5	31.5	37.2
1,250	30.9		31.5	
1,600	22.6		23.6	
2,000	24.7	33.7	25.9	34.9
2,500	32.9		34.2	
3,150	28		29.2	
4,000	27.1	31.2	28.1	32.2
5,000	23.8		24.3	
6,300	24.7		24.6	
8,000	20.8	26.6	19.7	26
10,000	18.1		15.6	

••• OVERALL LEVELS (2.5 - 10,000 Hz) •••

OASPL = 65.2 dB OASLA = 49.7 dB(A)


TITLE: HETF II\CC\NEW MG DC\ECS OFF
UNWEIGHTED SPL (dB)
A-WEIGHTED SL (dB(A))
LEVEL
90
80
70
60
50
40
30
20
10
2.5
3.15
4
5
6.3
8
10
12.5
16
20
25
31.5
40
50
63
80
100
125
160
200
250
315
400
500
630
800
1K
1.25K
1.6K
2K
2.5K
3.15K
4K
5K
6.3K
8K
10K
OVERALL
ONE-THIRD OCTAVE BAND CENTER FREQUENCY (Hz)

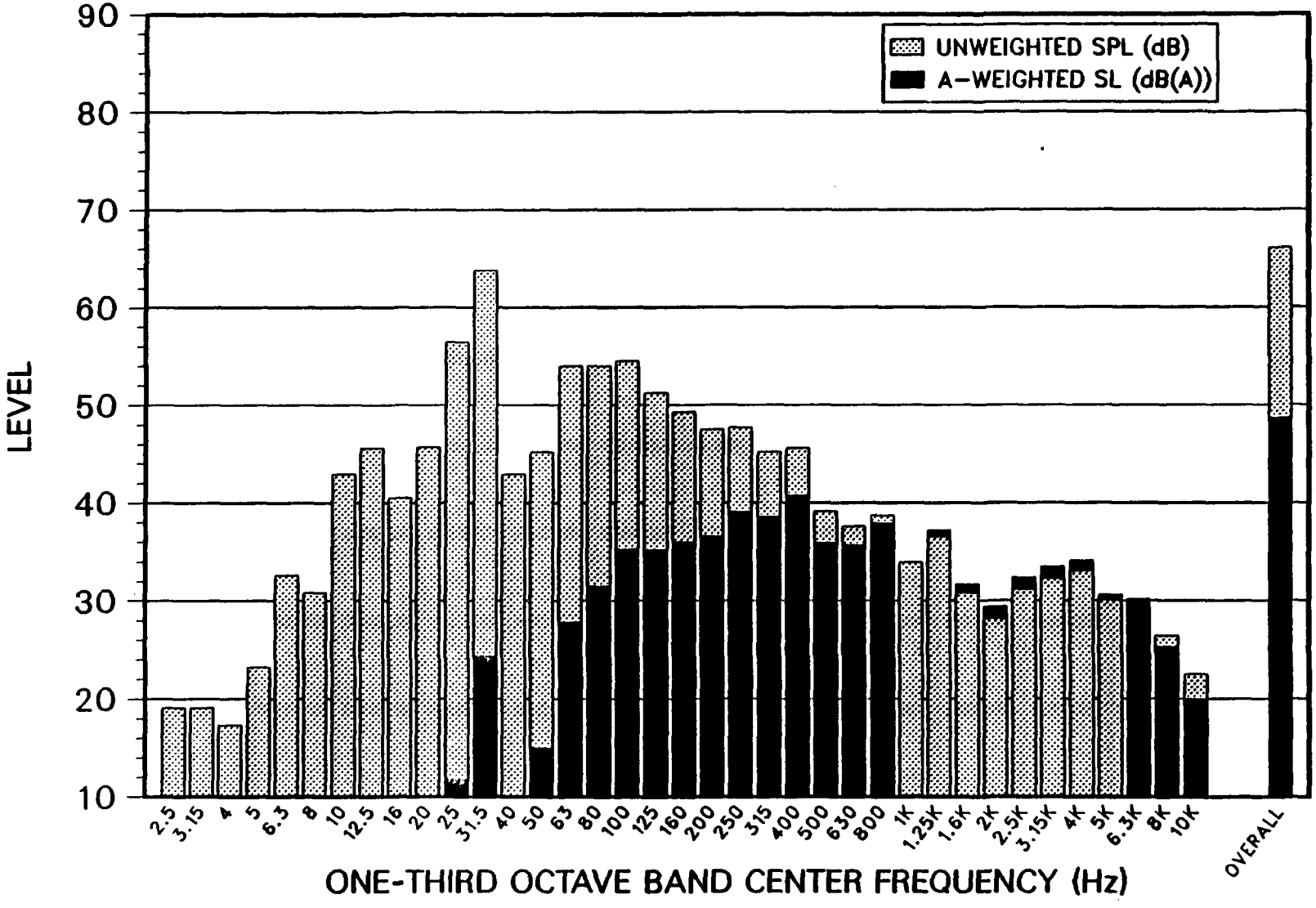
TITLE: HETF II\DCC\NEW MG DC\ECS OFF

FREQ (Hz)	SOUND PRESSURE LEVEL (dB)	OCTAVE BAND SPL (dB)	A-WEIGHTED SOUND LEVEL [dB(A)]	A-WEIGHTED OCTAVE BAND SL [dB(A)]
2.5	19.1		0	
3.15	19.1		0	
4	17.3	25.2	0	0
5	23.2		0	
6.3	32.6		0	
8	30.8	43.3	0	0
10	42.9		0	
12.5	45.6		0	
16	40.5	49.1	0	0
20	45.7		0	
25	56.5		11.8	
31.5	63.8	64.4	24.4	24.5
40	42.9		8.3	
50	45.2		15	
63	54	57.1	27.8	32.9
80	54		31.5	
100	54.5		35.3	
125	51.3	56.8	35.2	40.1
160	49.3		36	
200	47.5		36.6	
250	47.7	51.5	39.1	42.8
315	45.2		38.6	
400	45.6		40.8	
500	39.1	46.8	35.9	42.7
630	37.6		35.7	
800	38.7		37.9	
1,000	33.9	41.4	33.9	41.2
1,250	36.6		37.2	
1,600	30.8		31.7	
2,000	28.2	34.8	29.4	36
2,500	31.2		32.4	
3,150	32.3		33.5	
4,000	33.1	36.6	34.1	37.6
5,000	30.1		30.6	
6,300	30.2		30.1	
8,000	26.4	32	25.3	31.5
10,000	22.5		20	

*** OVERALL LEVELS (2.5 - 10,000 Hz) ***

OASPL = 66.1 dB OASLA = 48.7 dB(A)

TITLE: HETF II\DCC\NEW MG DC\ECS OFF



(This page left blank)

APPENDIX C

Intensity Measurements Over the Motor Generator

(This page left blank)

RTA 830
5.DEC.-88 12:56:29
LAST 12:56:27
Title:NEW MG AC (OFF) HETF II
N= 1 S= ?

FREQ.		Ieq		Lw		Leq		Lk
4.00	N	62.5	N	68.7	*	68.9	*	6.4
8.00	N	69.7	N	76.0	*	74.3	*	4.5
16.0	P	66.9	P	73.1	*	76.1	*	9.2
31.5	N	78.5	N	84.7	*	78.9	*	0.4
63.0	N	69.5	N	75.8	*	77.2	*	7.6
125	N	74.3	N	80.5	*	78.5	*	4.2
250	N	72.6	N	78.8	*	75.8	*	3.3
500	N	71.2	N	77.4	*	73.7	*	2.5
1.00k	N	67.0	N	73.2	*	69.6	*	2.7
2.00k	N	64.3	N	70.5	*	67.1	*	2.8
4.00k	N	61.7	N	67.9	*	64.5	*	2.9
8.00k	N	59.1	N	65.3	*	62.7	*	3.6
A	N	72.9	N	79.1	*	75.7	*	2.9
LIN	N	81.9	N	88.1	*	85.5	*	3.6

RTA 830
5.DEC.-88 12:56:01
LAST 12:57:58
Title:NEW MG AC (ON) HETF II
N= 1 S= ?

FREQ.		Ieq		Lw	Leq	Lk
4.00	P	61.4	P	67.6	68.8	7.4
8.00	N	60.4	N	66.6	73.4	13.0
16.0	P	66.3	P	72.5	76.2	10.0
31.5	N	68.1	N	74.3	77.8	9.7
63.0	P	51.0	P	57.4	77.7	26.6
125	P	59.6	P	65.8	76.7	17.2
250	N	47.5	N	53.7	68.2	20.7
500	N	50.1	N	56.3	62.7	12.6
1.00k	N	43.2	N	49.4	53.3	10.2
2.00k	N	41.4	N	47.6	50.5	9.1
4.00k	N	42.6	N	48.8	49.8	7.2
8.00k	N	40.4	N	46.6	46.9	6.4
A	N	49.0	N	55.2	65.3	16.4
LIN	N	58.5	N	64.7	83.9	25.4

RTA 830
5.DEC.-88 12:59:13
LAST 12:59:10
Title:NEW MG DC (ON) HETF II
N= 1 S= ?

FREQ.		Ieq		Lw	Leq	Lk
4.00	N	64.1	N	70.3	69.0	4.9
8.00	N	66.7	N	72.9	73.6	6.9
16.0	P	68.8	P	75.0	76.4	7.6
31.5	N	71.2	N	77.4	79.4	8.2
63.0	N	58.9	N	65.1	77.6	18.7
125	N	48.2	N	54.6	76.5	28.3
250	P	46.5	P	52.6	67.4	20.9
500	N	49.1	N	55.3	62.4	13.3
1.00k	N	45.2	N	51.4	53.1	7.9
2.00k	N	43.2	N	49.4	50.6	7.4
4.00k	N	47.8	N	54.0	52.8	5.0
8.00k	N	42.1	N	48.3	48.1	6.0
A	N	52.1	N	58.3	65.4	13.2
LIN	N	71.1	N	77.3	84.3	13.3

RTA 830
5.DEC.-88 13:00:10
LAST 13:00:08
Title:NEW MG DC (OFF) ECS DC HETF II
N= 1 S= ?

FREQ.		Ieq		Lw	Leq	Lk
4.00	P	67.6	P	73.8	69.0	1.4
8.00	N	72.4	N	78.6	74.9	2.5
16.0	P	68.8	P	75.0	76.3	7.5
31.5	N	87.4	N	93.6	86.0	- 1.4
63.0	N	68.2	N	74.4	77.0	8.7
125	N	76.1	N	82.3	79.1	3.0
250	N	72.2	N	78.4	75.5	3.3
500	N	71.7	N	77.9	74.2	2.5
1.00k	N	68.3	N	74.5	70.9	2.6
2.00k	N	65.6	N	71.8	68.1	2.5
4.00k	N	66.3	N	72.5	69.1	2.8
8.00k	N	61.4	N	67.6	65.0	3.6
A	N	74.3	N	80.5	77.1	2.7
LIN	N	86.1	N	94.3	88.5	0.3

RTA 830
5.DEC.-88 13:02:39
LAST 13:02:37
Title:OLD MG AC (ON) HETF I
N= 1 S= ?

FREQ.		Ieq		Lw	Leq	Lk
4.00	P	67.9	P	71.9	74.4	6.5
8.00	N	64.1	N	68.2	70.3	6.2
16.0	P	61.4	P	65.5	72.6	11.2
31.5	P	64.5	P	68.6	73.6	9.1
63.0	N	63.5	N	67.6	75.4	11.9
125	N	59.1	N	63.2	70.9	11.9
250	N	53.2	N	57.3	68.0	14.8
500	N	54.1	N	58.2	66.1	12.0
1.00k	N	56.0	N	60.1	66.9	10.9
2.00k	P	33.7	P	37.8	56.6	22.9
4.00k	P	38.4	P	42.5	54.5	16.1
8.00k	P	35.9	P	39.9	48.9	13.1
A	N	57.0	N	61.0	69.2	12.2
LIN	P	69.1	P	73.2	81.9	12.8

RTA 830
5.DEC.-88 13:03:17
LAST 13:03:15
Title:OLD MG DC (ON) HETF I
N= 1 S= ?

FREQ.		Ieq		Lw	Leq	Lk
4.00	P	63.7	P	67.8	61.5	- 2.3
8.00	P	64.1	P	68.2	57.1	- 7.0
16.0	N	62.2	N	66.3	68.6	6.4
31.5	N	65.1	N	69.2	80.4	15.3
63.0	P	70.4	P	74.5	80.4	10.0
125	N	61.0	N	65.0	72.3	11.3
250	N	62.5	N	66.6	75.3	12.8
500	P	54.2	P	58.4	71.2	16.9
1.00k	P	56.4	P	60.5	71.5	15.2
2.00k	P	49.4	P	53.5	64.7	15.3
4.00k	P	35.4	P	39.5	54.1	18.7
8.00k	P	35.0	P	39.1	47.4	12.4
A	P	57.2	P	61.3	74.7	17.5
LIN	P	68.6	P	72.7	84.9	16.3

RTA 830
5.DEC.-88 13:04:10
LAST 13:04:08
Title:OLD MG AC (OFF) HETF I
N= 1 S= ?

FREQ.		Ieq		Lw	Leq	Lk
4.00	P	68.0	P	72.1	73.3	5.4
8.00	N	73.0	N	77.1	70.7	- 2.4
16.0	N	72.9	N	76.9	72.6	- 0.3
31.5	N	76.4	N	80.5	74.7	- 1.7
63.0	N	80.9	N	85.0	81.7	0.8
125	N	73.4	N	77.5	75.1	1.6
250	N	71.8	N	75.9	73.9	2.1
500	N	73.7	N	77.8	75.1	1.4
1.00k	N	75.3	N	79.4	76.9	1.6
2.00k	N	63.5	N	67.6	65.6	2.1
4.00k	N	56.6	N	60.6	59.4	2.8
8.00k	N	47.6	N	51.7	52.4	4.9
A	N	76.8	N	80.9	78.4	1.6
LIN	N	84.9	N	89.0	85.8	1.0

RTA 830
5.DEC.-88 13:04:52
LAST 13:04:50
Title:OLD MG DC (OFF) HETF I
N= 1 S= ?

FREQ.		Ieq		Lw	Leq	Lk
4.00	N	70.4	N	74.5	73.1	2.7
8.00	P	61.6	P	65.6	70.4	8.8
16.0	N	72.3	N	76.4	72.5	0.2
31.5	N	77.8	N	81.9	79.2	1.4
63.0	N	90.5	N	94.6	93.4	2.9
125	N	74.5	N	78.6	76.3	1.7
250	N	72.3	N	76.3	74.7	2.5
500	N	72.5	N	76.5	73.8	1.3
1.00k	N	75.5	N	79.6	76.6	1.2
2.00k	N	64.8	N	68.9	66.5	1.7
4.00k	N	59.0	N	63.0	60.9	1.9
8.00k	N	47.7	N	51.8	52.1	4.4
A	N	77.0	N	81.1	78.5	1.4
LIN	N	91.2	N	95.3	94.0	2.8

RTA 830
5.DEC.-88 13:06:21
LAST 13:06:18
Title:NEW MG DC (OFF) ECS DC HETF I
N= 1 S= ?

FREQ.		Ieq		Lw	Leq	Lk
4.00	P	68.6	P	74.8	61.5	- 7.1
8.00	P	68.3	P	74.5	60.5	- 7.9
16.0	N	65.4	N	71.6	68.7	3.3
31.5	P	52.5	P	58.5	75.7	23.2
63.0	N	79.7	N	85.9	85.1	5.5
125	N	75.5	N	81.7	77.5	2.0
250	N	64.1	N	70.3	73.5	9.4
500	N	68.1	N	74.3	73.4	5.3
1.00k	P	64.8	P	71.0	72.0	7.2
2.00k	N	65.9	N	72.1	69.9	4.1
4.00k	N	56.1	N	62.3	59.3	3.3
8.00k	N	52.6	N	58.8	55.9	3.2
A	N	68.4	N	74.6	76.4	8.0
LIN	N	81.1	N	87.3	87.0	5.9

RTA 830
5.DEC.-88 13:07:08
LAST 13:07:06
Title:NEW MG DC (ON) ECS DC HETF I
N= 1 S= ?

FREQ.		Ieq		Lw	Leq	Lk
4.00	P	68.3	P	74.5	61.4	- 6.9
8.00	P	62.8	P	69.0	55.4	- 7.4
16.0	P	60.6	P	66.8	67.9	7.3
31.5	N	67.9	N	74.1	76.0	8.1
63.0	P	62.2	P	68.4	81.3	19.1
125	N	61.5	N	67.7	74.0	12.5
250	N	62.0	N	68.2	74.6	12.6
500	N	52.8	N	59.0	70.8	17.9
1.00k	P	47.4	P	53.6	71.6	24.1
2.00k	N	43.3	N	49.5	66.5	23.2
4.00k	P	26.6	P	33.0	53.8	27.2
8.00k	P	22.9	P	29.2	44.3	21.4
A	N	54.7	N	60.9	74.8	20.1
LIN	P	67.1	P	73.3	84.3	17.2

RTA 830
5.DEC.-88 13:09:19
LAST 13:09:17
Title:NEW MG AC (OFF) ECS AC HETF I
N= 1 S= ?

FREQ.	Ieq	Lw	Leq	Lk
4.00	P* 61.8	P* 68.3	* 74.1	* 12.3
8.00	N* 71.3	N* 77.5	* 71.6	* 0.4
16.0	N* 67.2	N* 73.4	* 72.8	* 5.7
31.5	N* 69.6	N* 75.8	* 72.6	* 2.9
63.0	N* 79.1	N* 85.3	* 84.0	* 4.9
125	N* 76.5	N* 82.7	* 77.8	* 1.3
250	N* 70.3	N* 76.5	* 73.4	* 3.1
500	N* 68.5	N* 74.7	* 71.5	* 3.0
1.00k	N* 62.6	N* 68.8	* 65.6	* 2.9
2.00k	N* 65.2	N* 71.4	* 67.6	* 2.4
4.00k	N* 57.0	N* 63.2	* 60.2	* 3.2
8.00k	N* 53.6	N* 59.8	* 57.1	* 3.4
A	N* 70.9	N* 77.1	* 73.7	* 2.8
LIN	N* 83.0	N* 89.2	* 86.5	* 3.6

RTA 830
5.DEC.-88 13:10:46
LAST 13:10:44
Title:NEW MG AC (ON) ECS AC HETF I
N= 1 S= ?

FREQ.	Ieq	Lw	Leq	Lk
4.00	P 59.9	P 66.1	74.3	14.4
8.00	N 66.1	N 72.3	70.4	4.4
16.0	P 64.4	P 70.6	71.3	6.9
31.5	P 65.6	P 71.7	71.5	5.9
63.0	N 72.7	N 78.9	82.4	9.7
125	P 51.8	P 58.0	70.3	18.5
250	N 46.4	N 52.6	66.4	20.0
500	N 48.9	N 55.1	63.7	14.8
1.00k	N 40.5	N 46.7	56.5	16.1
2.00k	N 44.2	N 50.4	57.1	12.9
4.00k	P 32.3	P 38.5	53.6	21.3
8.00k	P 29.1	P 35.3	47.4	18.3
A	N 50.8	N 57.0	65.7	14.8
LIN	N 71.1	N 77.3	84.4	13.3

RTA 830
5.DEC.-88 13:11:50
LAST 13:11:48
Title:NEW MG W/PM AC ECS AC (ON) HETFI
N= 1 S= ?

FREQ.	Ieq	Lw	Leq	Lk
4.00	P* 72.5	P* 78.7	* 74.1	* 1.7
8.00	P* 72.3	P* 78.5	* 70.7	*- 1.7
16.0	P* 72.0	P* 78.2	* 72.1	* 0.1
31.5	P* 66.0	P* 72.2	* 71.2	* 5.3
63.0	N* 72.5	N* 78.7	* 81.0	* 8.6
125	N* 42.5	N* 48.9	* 69.6	* 27.1
250	P* 45.7	P* 51.9	* 65.8	* 20.1
500	P* 47.4	P* 53.7	* 62.4	* 14.9
1.00k	N* 36.9	N* 43.1	* 56.1	* 19.2
2.00k	N* 42.0	N* 48.3	* 56.6	* 14.6
4.00k	P* 35.0	P* 41.2	* 53.6	* 18.6
8.00k	P* 35.5	P* 41.7	* 49.1	* 13.6
A	N* 45.2	N* 51.4	* 64.9	* 19.7
LIN	P* 75.8	P* 82.0	* 83.5	* 7.7

RTA 830
5.DEC.-88 13:12:43
LAST 13:12:41
Title:NEW MG W/PM AC ECS AC (OFF) I
N= 1 S= ?

FREQ.	Ieq	Lw	Leq	Lk
4.00	P 72.3	P 78.5	74.2	1.9
8.00	N 74.9	N 81.1	71.8	- 3.1
16.0	N 71.5	N 77.7	72.4	0.9
31.5	N 70.7	N 76.9	71.9	1.2
63.0	N 80.3	N 86.5	82.5	2.2
125	N 75.9	N 82.1	76.8	0.9
250	N 69.7	N 75.9	72.4	2.7
500	N 69.7	N 75.9	72.5	2.9
1.00k	N 62.7	N 68.9	65.2	2.5
2.00k	N 64.9	N 71.1	67.1	2.2
4.00k	N 57.0	N 63.2	60.4	3.5
8.00k	N 53.6	N 59.8	59.1	5.5
A	N 71.0	N 77.2	73.6	2.6
LIN	N 82.8	N 89.0	85.6	2.7

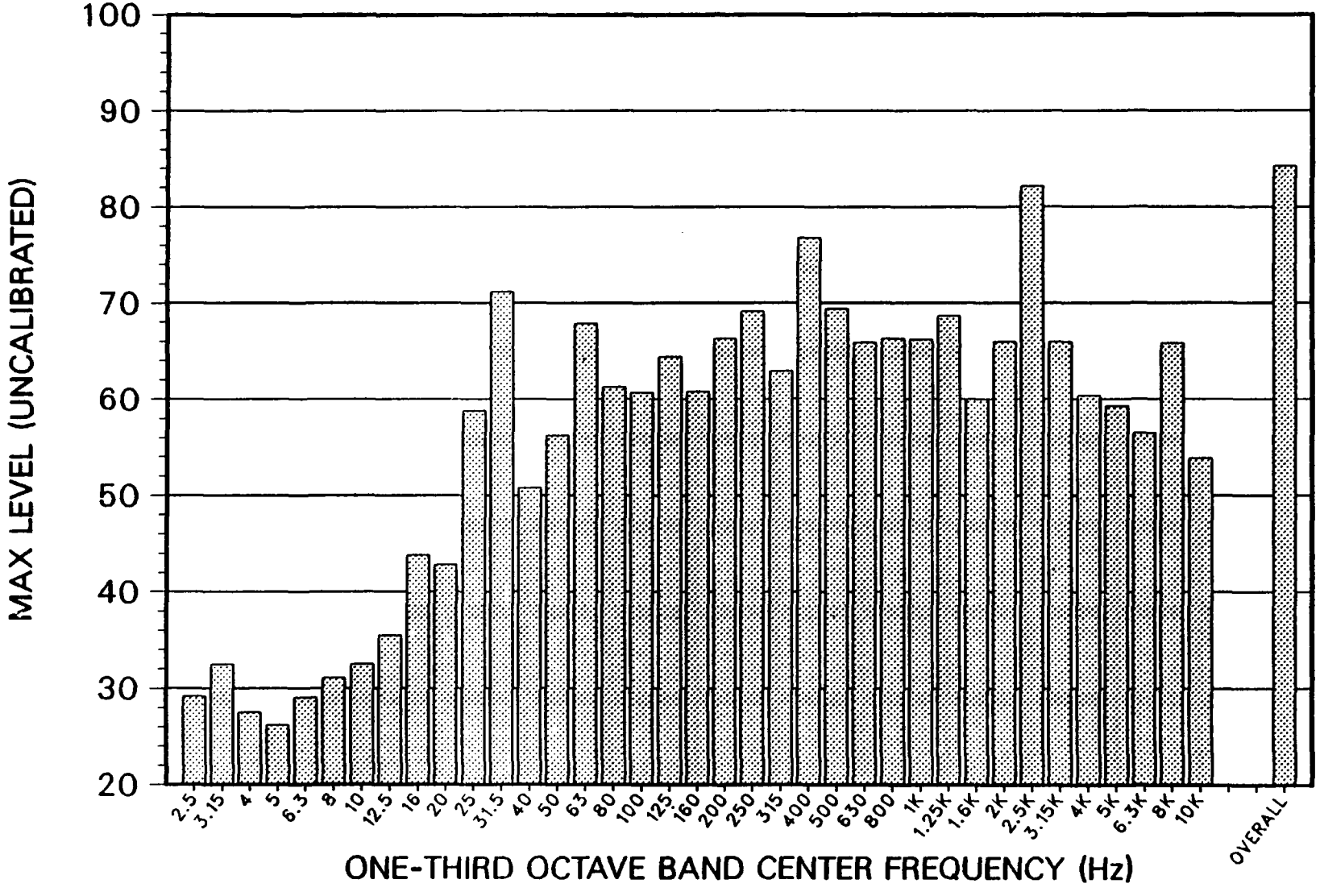
(This page left blank)

APPENDIX D

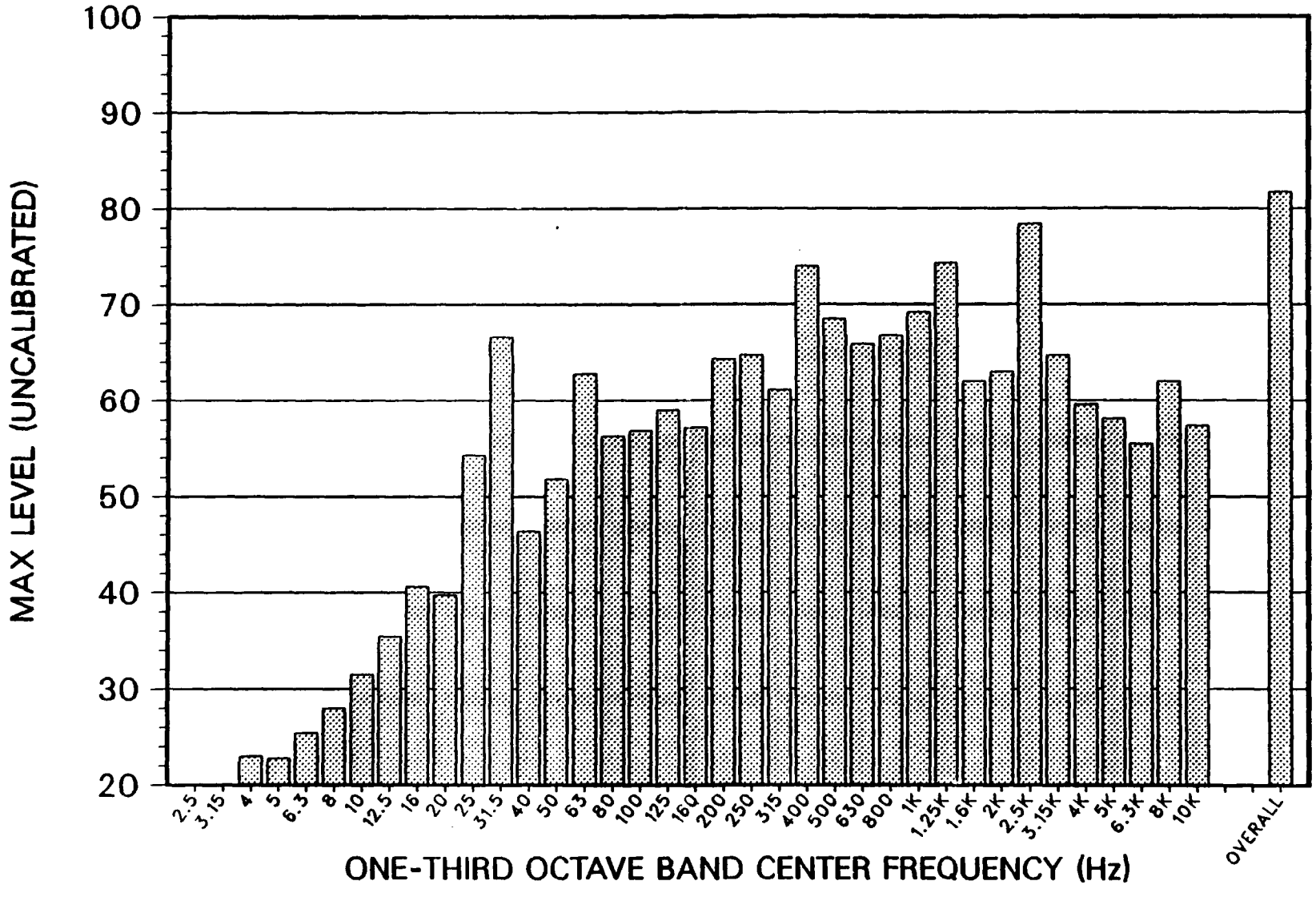
Vibration Measurements

(This page left blank)

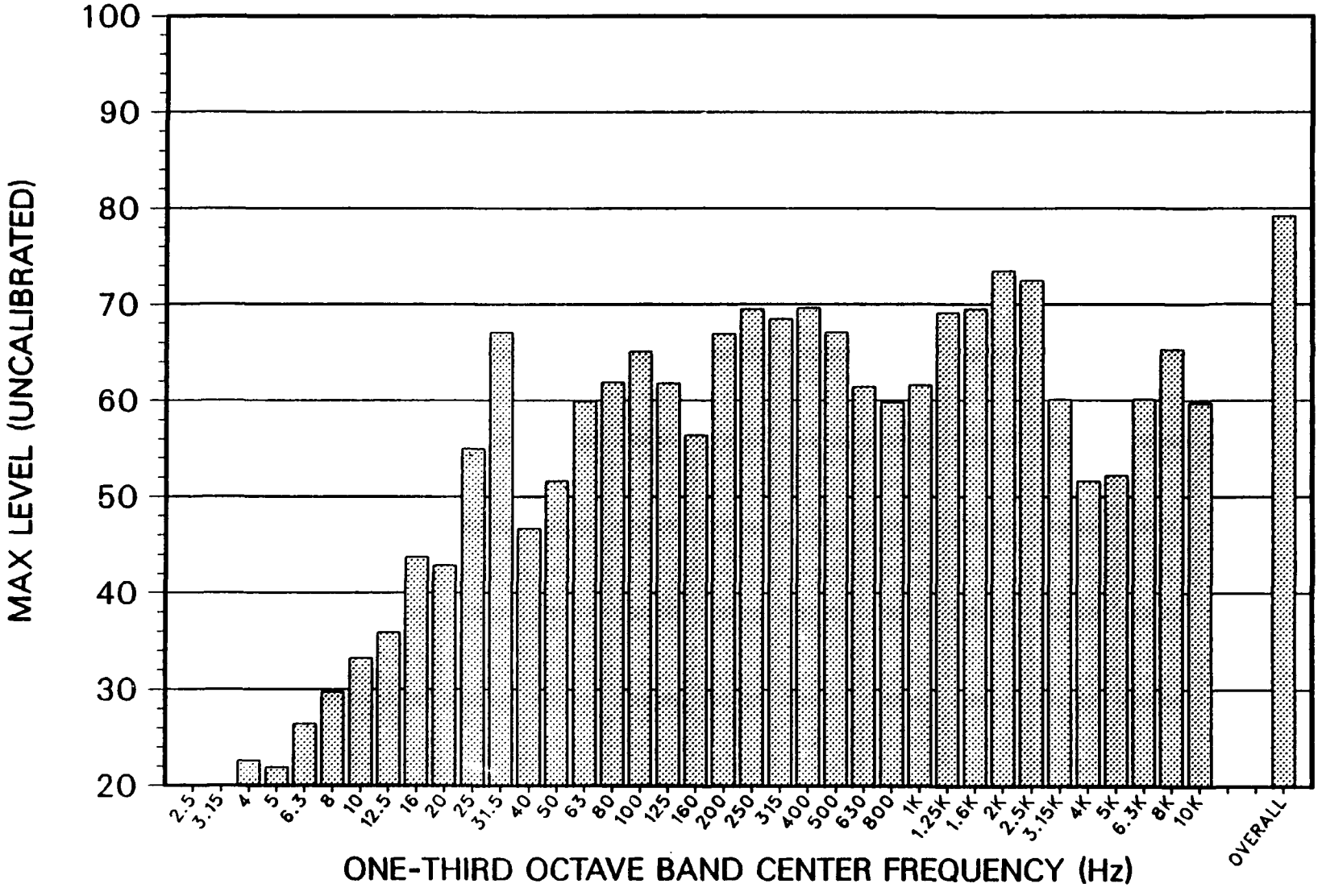
TITLE: VIBRATION MG MOUNT POINT A



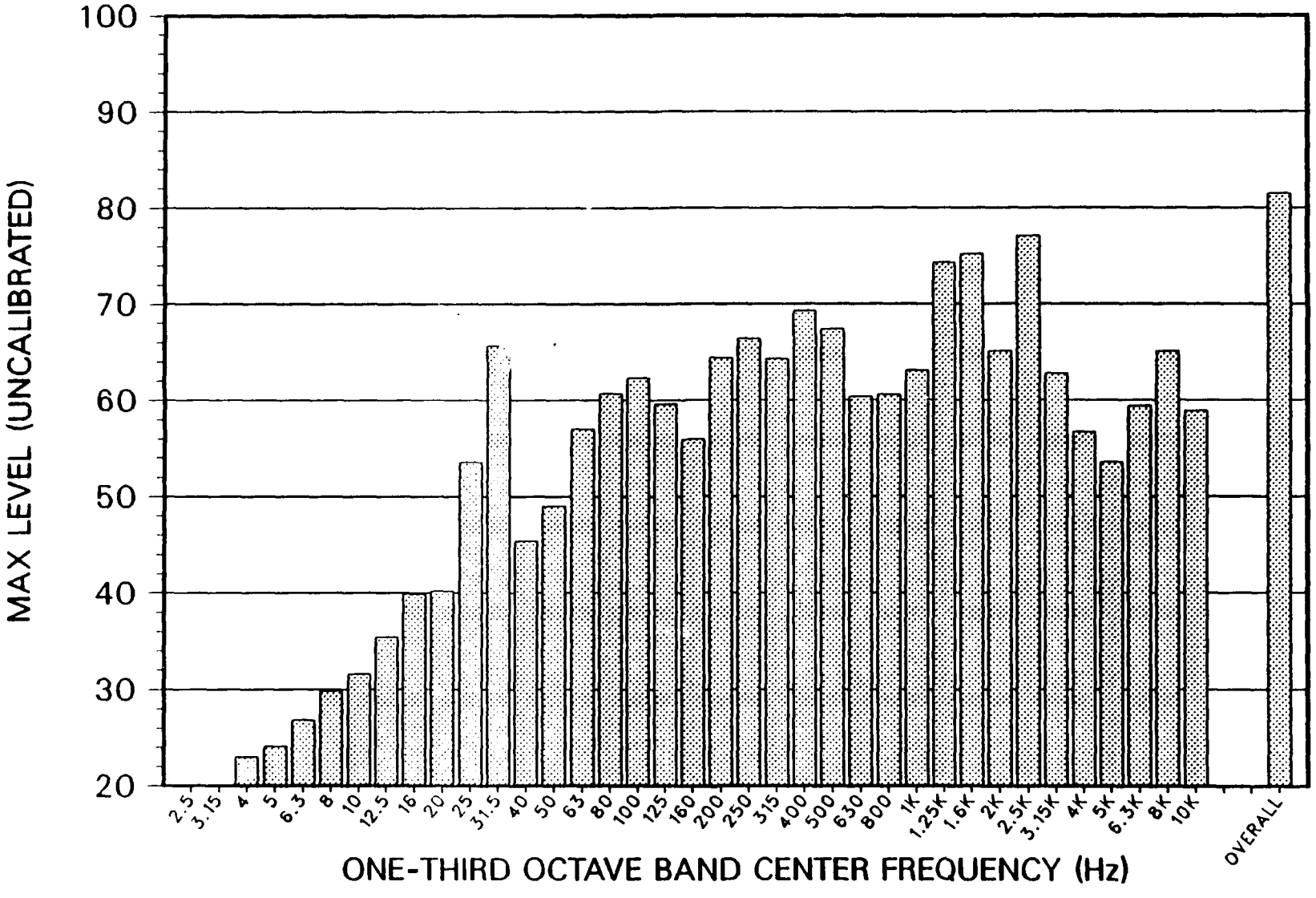
TITLE: VIBRATION MG FLOOR POINT A



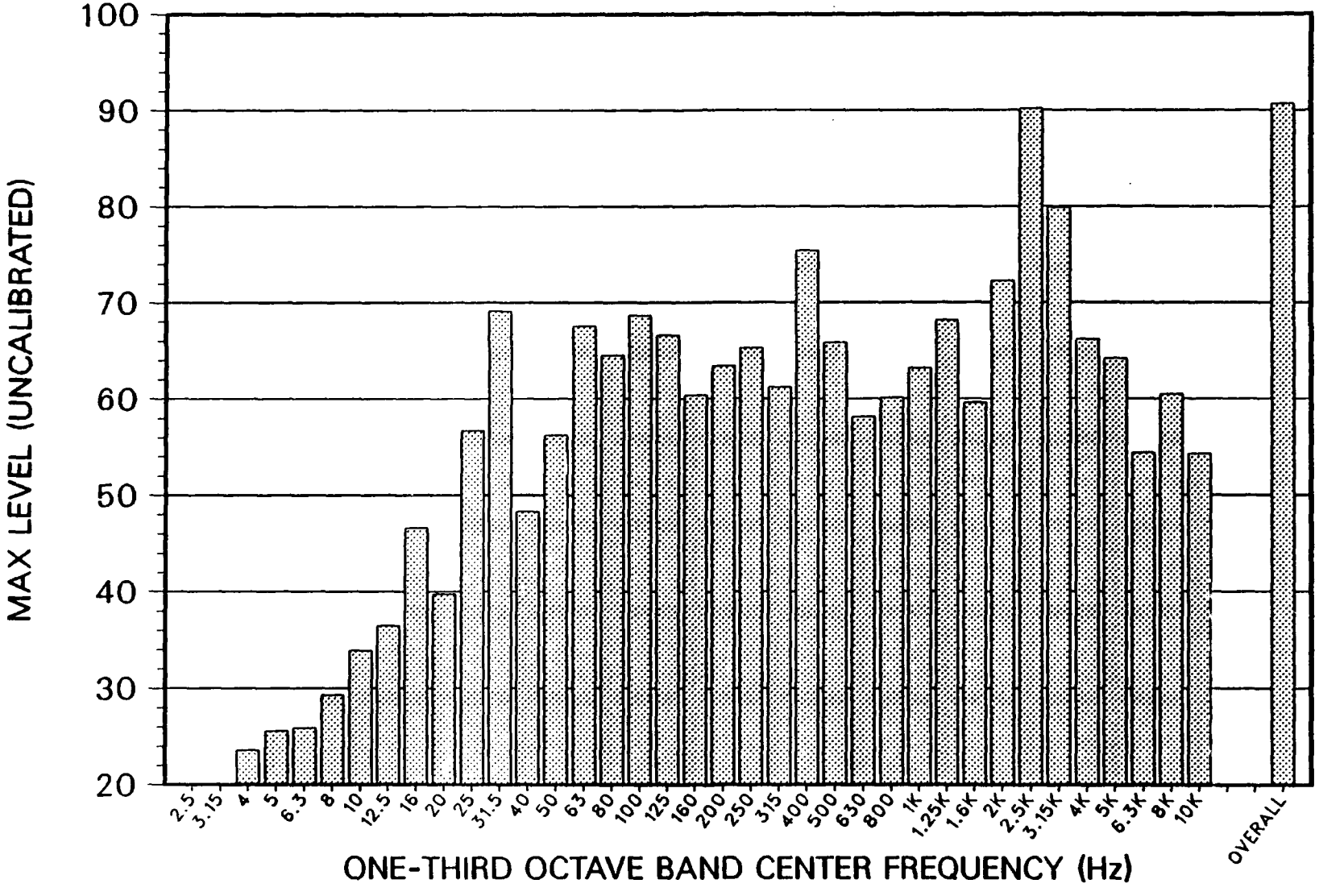
TITLE: VIBRATION MG MOUNT POINT B



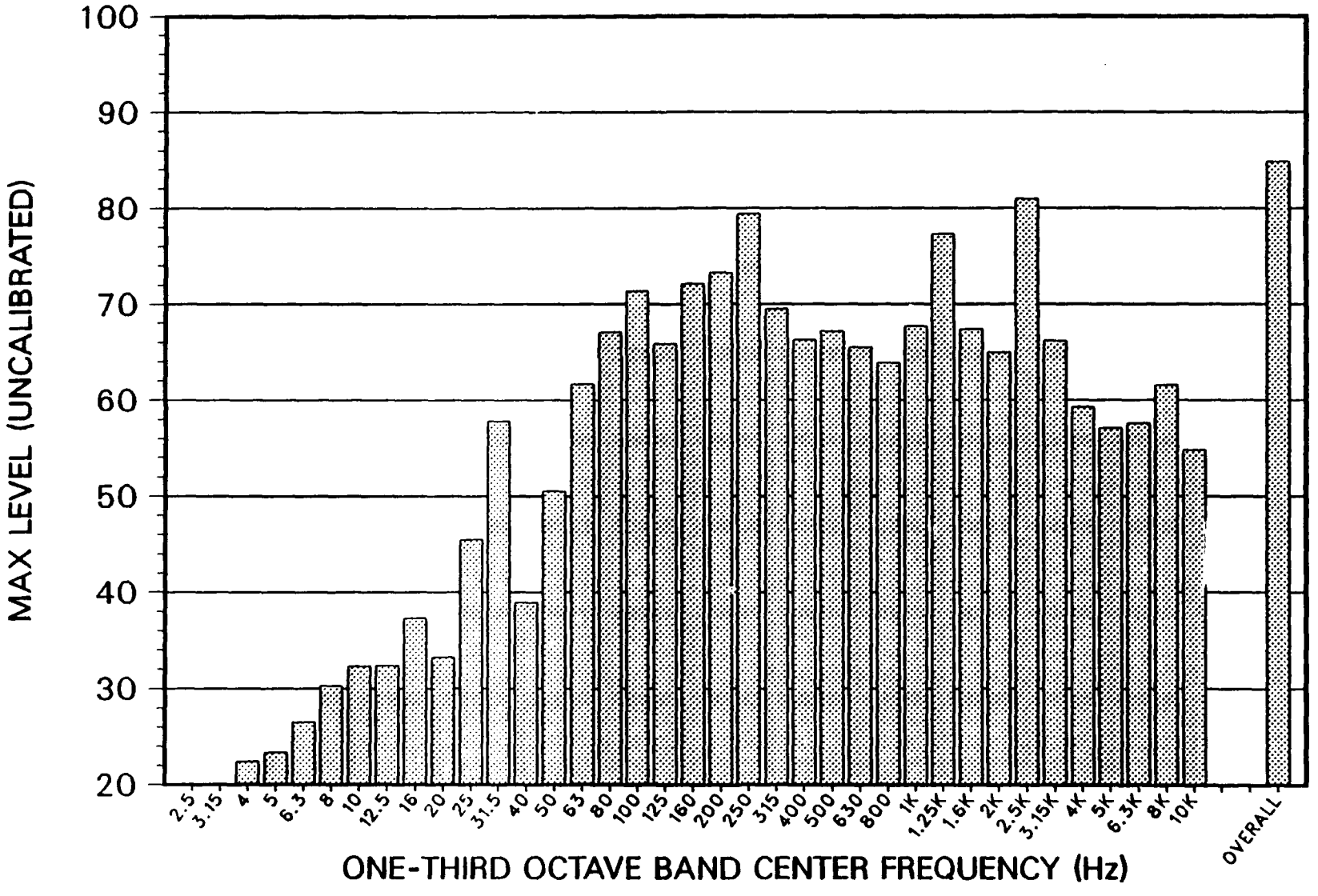
TITLE: VIBRATION MG FLOOR POINT B



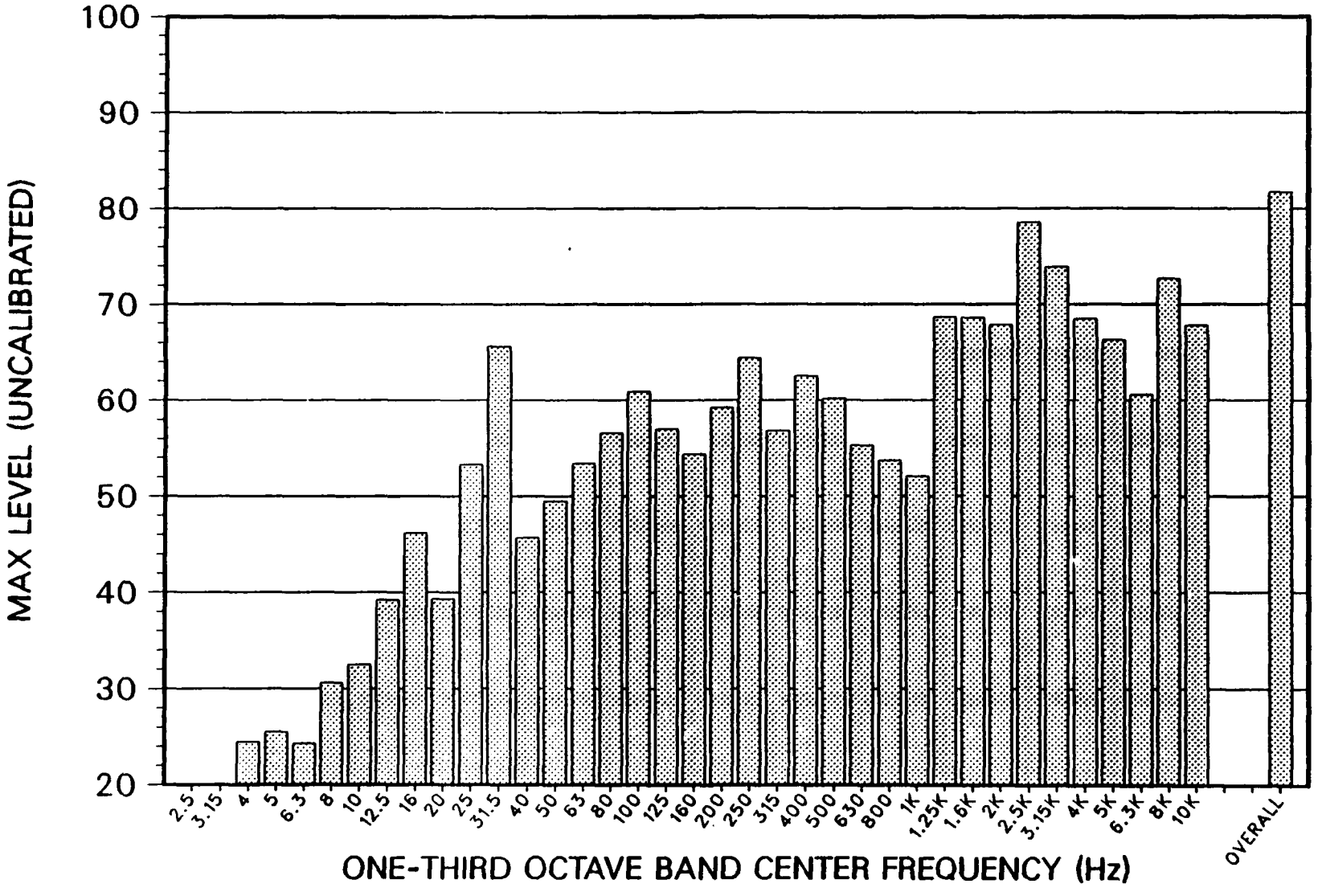
TITLE: VIBRATION MG MOUNT POINT C



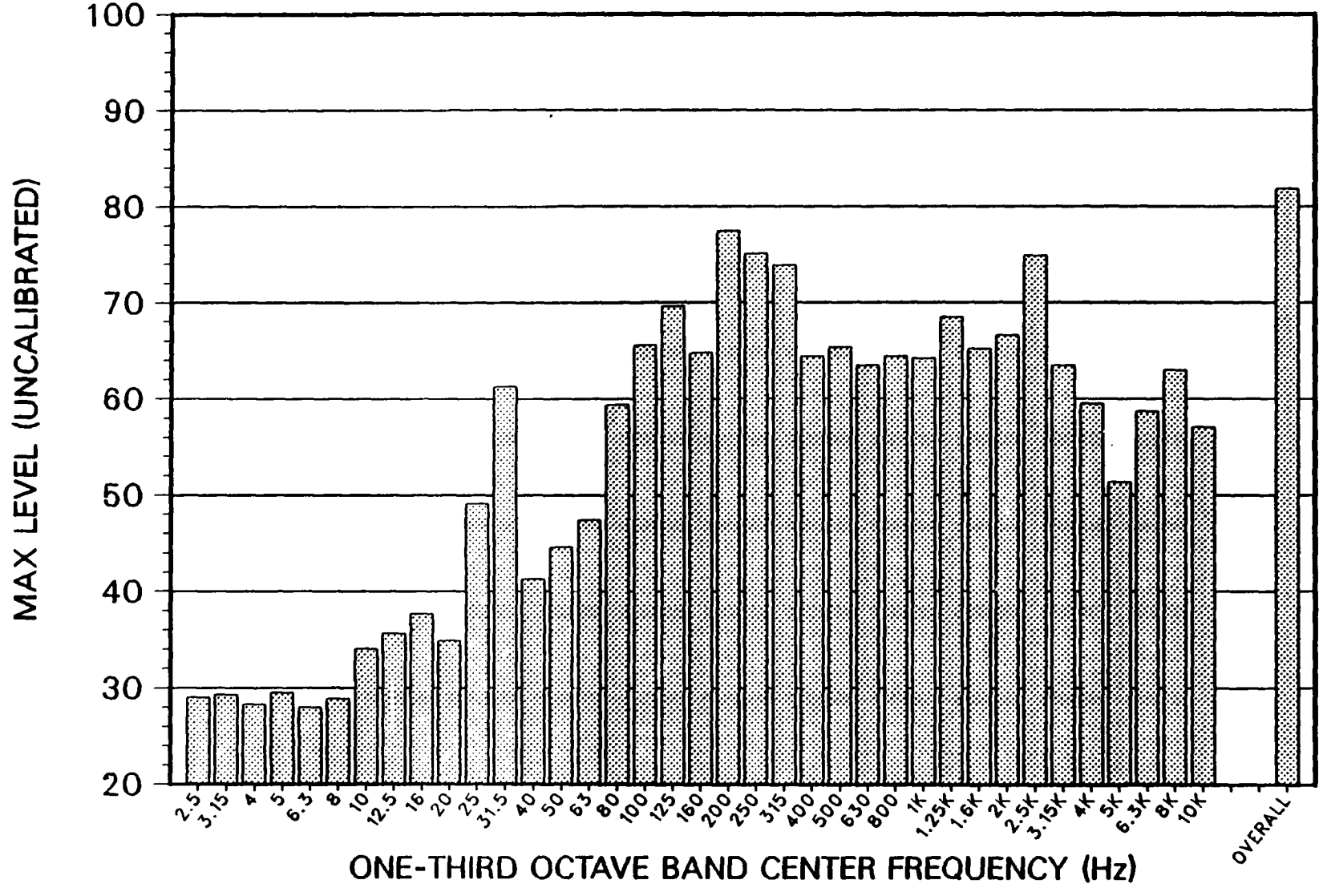
TITLE: VIBRATION MG FLOOR POINT C



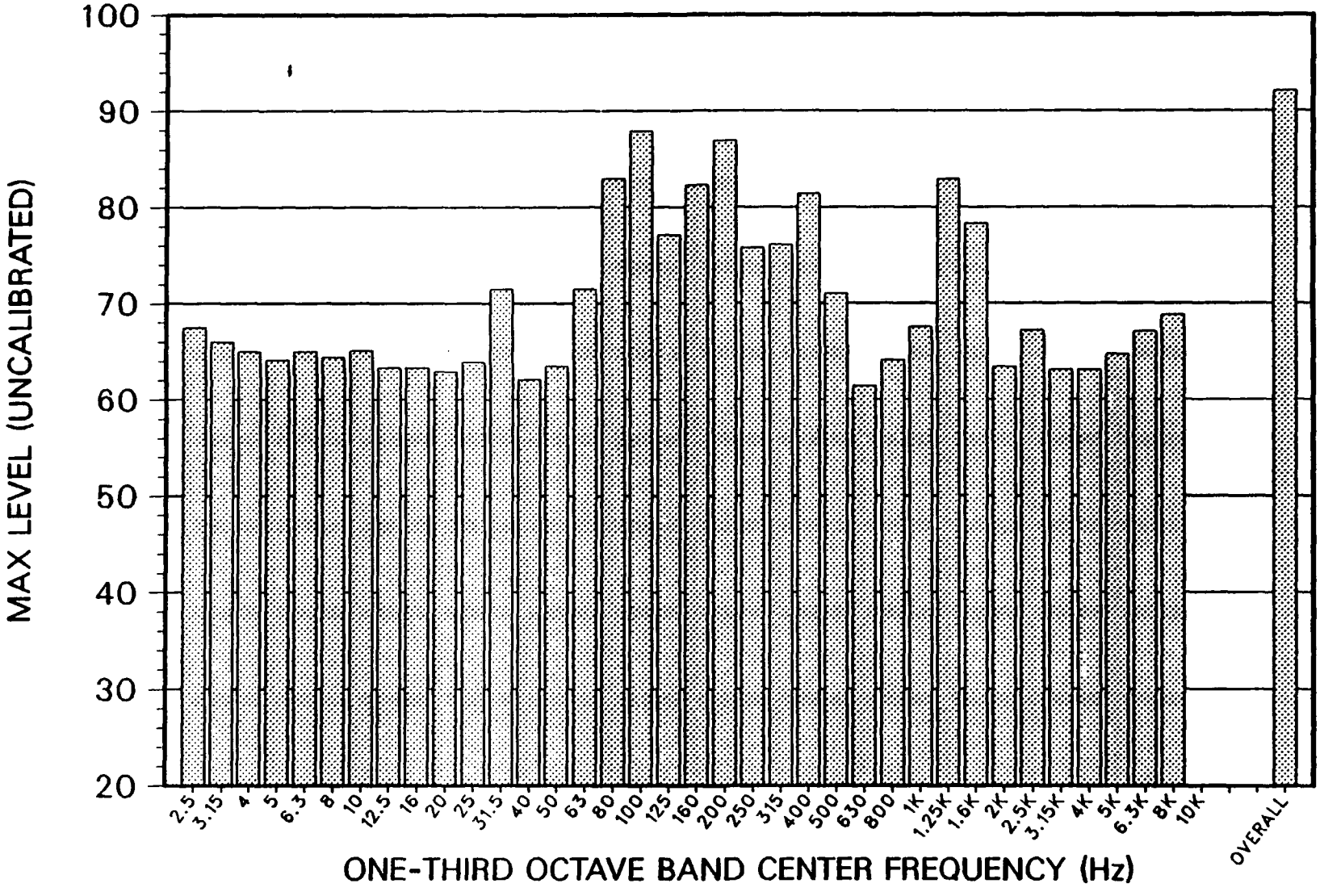
TITLE: VIBRATION MG MOUNT POINT D



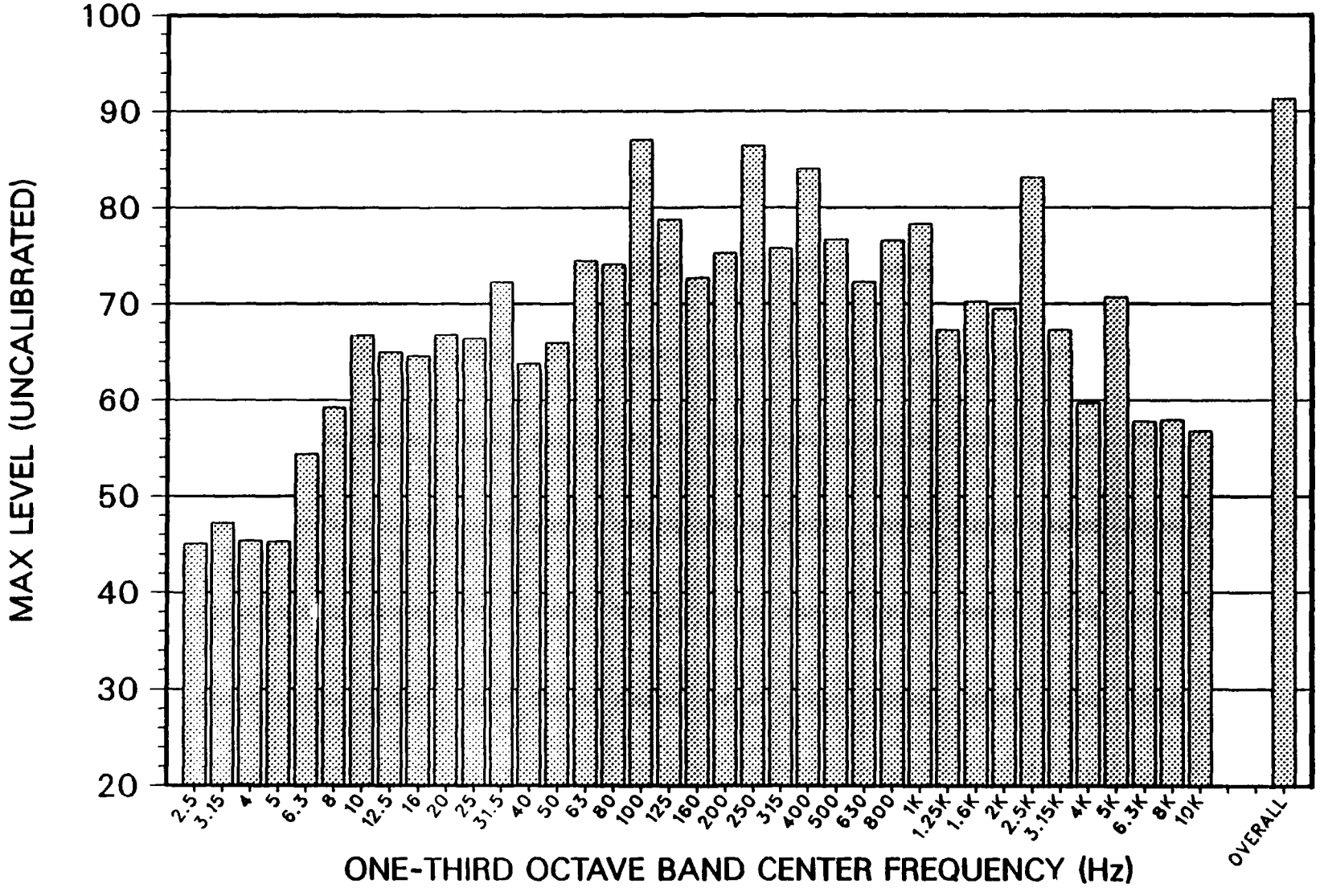
TITLE: VIBRATION MG FLOOR POINT D



TITLE: VIBRATION ON MG POINT E



TITLE: VIBRATION ON MG POINT F



Distribution List

	Copies
OO-ALC/MMGRMM Hill AFB UT 84056-5000	5
OO-ALC/MMGMM Hill AFB UT 84056-5000	1
HQ SAC/SGPB Offutt AFB NE 68113-5001	5
AAMRL/BB Wright-Patterson AFB OH 45433-6573	2
HQ AFSC/SGPB Andrew AFB MD 20334-5000	1
HQ USAF/SGPA Bolling AFB DC 20332-6188	1
USAF Regional Medical Center Wiesbaden/SGB APO NEW York 09220-5300	1
OL AD, AFOEHL APO San Francisco 96274-5000	1
USAFSAM/TSK/EDH Brooks AFB TX 78235-5301	1 ea
Defense Technical Information Center (DTIC) Cameron Station Alexandria VA 22304-6145	2
HQ HSD/XAE Brooks AFB TX 78235-5000	1